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HILDEBRANDT (A. C.), RIKER (A. J.), & DUGGAR (B. M.). **The influence of the composition of the medium on growth in vitro of excised Tobacco and Sunflower tissue cultures.**—*Amer. J. Bot.*, xxxiii, 7, pp. 591–597, 3 figs., 1946.

After stating that in their earlier work on crown gall [*Bacterium tumefaciens*] metabolites [cf. *R.A.M.*, xxvi, p. 238] certain extracts were found to stimulate the growth of plant tissues in cultures, the authors describe investigations in which the growth of over 8,000 tissue cultures each of tobacco and sunflower in the first passage was examined in 108 different media, with increasing and decreasing concentrations of the constituents of the basal medium, plus ferric tartrate, pyridoxine, and nicotinic acid. Formulae of improved media for tobacco and sunflower tissue cultures are given.

HENDRICKX (L.). **Le mildiou de la Pomme de terre au Congo belge.** [Potato late blight in the Belgian Congo.]—*Bull. Inst. colon. belge*, xvii, 3, pp. 996–1005, 1946.

The appearance of potato late blight (*Phytophthora infestans*) in the Belgian Congo in 1942 [*R.A.M.*, xxvi, p. 235] is attributed to spread from Kenya [ibid., xxvi, p. 234], whence the disease rapidly passed to all the highland regions of central Africa where the crop is grown, i.e., Tanganyika Territory, Uganda, and the eastern part of the Belgian Congo.

The potato is a recent introduction to the Congo, and its cultivation on a commercial scale is confined to the eastern area and to places at high altitudes, such as Thysville. The appearance of *P. infestans* immediately caused great damage, since the plants, grown from tubers and seed of widely different origin, were a very heterogeneous population. The fact that the potato was present in a semi-wild state, e.g., in coffee plantations, in many localities greatly facilitated spread. The disease swept across the country in 1942–3, when no resistant planting material could be obtained from Belgium. In the hilly parts of Kivu, although plant growth slows down considerably in the dry season from May to September, the disease never disappears, since it finds conditions that maintain it in an endemic state in the low-lying areas and swamps.

Directly the disease appeared temporary measures, such as spraying and planting tubers during the dry season in land that could easily be irrigated, were recommended, but such measures cannot be applied by the natives. Further, the use of Bordeaux mixture did not always give satisfactory results, probably because it was applied too late. The only suitable method of control locally is the use of resistant varieties.

Work was at once begun at Mulungu. A collection of almost every potato variety grown in the Congo and tubers from any plant that appeared to have shown resistance were used for resistance trials in 1943, 1944, and 1945, none of which except (?) Skerry Blue [loc. cit.] gave satisfactory results. On the whole, early varieties were better than late. Varieties that flowered easily were highly susceptible.

In January, 1945, the author obtained through Nattrass [loc. cit.] two tubers of *Solanum demissum* and hybrids 759, 834, 835, 836, and 914 of *S. tuberosum* and *S. demissum*, and the Mulungu Station received a few tubers of the following clones: Salaman 1, 2, 3, Salaman-Clark 1, 2, 3, 4, and Dutch Robijn. Except for the last named and hybrid 759 all these varieties showed resistance, but were very susceptible to *Alternaria solani*. In 1946 the resistant selections were grown for tuber supply and on 6th June the disease appeared. *S. demissum* plants in the immediate vicinity remained unaffected. It seems that a new physiological form of the fungus has developed by mutation, which was able to infect the hybrids but not the parent *S. demissum*. Crosses with another clone of *S. demissum* will have to be made.

MOTTE (J.). **Mycopathologie d'Oryza sativa. 1. La piriculariose.** [Mycopathology of *Oryza sativa*. 1. Piriculariosis.]—*Rev. Mycologie, Suppl. colon.*, xi, 1, pp. 3–20, 2 figs., 1 map, 1946.

This account, based chiefly on the literature, of *Piricularia oryzae* on rice [*R.A.M.*, xxiv, p. 128; xxvi, p. 315] includes a definition of the disease, its common names, physiological races [ibid., xv, p. 740], and nature of the damage on various parts of the plant. Some account is given of the progress of the disease, the methods of infection, and the entry of the parasite and secondary invaders. The relative influence of external conditions is discussed, and accessory gramineous hosts are listed. Treatment of the disease, the nature of resistance, and the geographical distribution are briefly reviewed. A comprehensive bibliography is appended.

MOREAU (C.). **La maladie du 'gigantisme' du Riz au Cameroun.** [The Rice disease 'gigantism' in the Cameroons.]—*Rev. Mycologie, Suppl. colon.*, xi, 1, pp. 30–31, 1946.

Specimens of rice from the Cameroons infected with *Gibberella fujikuroi* [*R.A.M.*, xxv, p. 357] have been received by the author. This is the first record of *G. fujikuroi* in the territory [ibid., xxvi, p. 32].

DEPOERK (R.). **Sur un nouveau procédé de lutte contre les pourridiés en hévéaculture.** [On a new method for the control of root rots of *Hevea*.]—*Bull. Inst. colon. belge*, xvii, 3, pp. 980–986, 1946.

Heavy losses are caused to *Hevea* rubber in the Belgian Congo by root rots due to *Fomes lignosus* and *Ganoderma pseudoferreum* [*R.A.M.*, xxv, pp. 28, 358], while *Armillaria mellea* [ibid., iii, 509] is very harmful as a wound parasite. In some plantations near Stanleyville, established between 1922 and 1924, only a few survivors remain, while in others, hardly more than ten years old, already there is 35 to 50 per cent. loss. Against these rots the author recommends the sanitary measures employed in Malaya [ibid., xii, p. 54; xvii, p. 62] but with certain modifications suggested by African conditions.

Powdered copper sulphate crystals are used at the rate of 100 gm. per tree, transport of water to make solutions being too difficult and expensive locally. The crystals are ground up with three times their weight of earth and the mixture sprinkled on the excavated area. Rain acts as a diluent and with percolation the solution formed creates a more or less sterile cylinder of soil round the tap-root. Tests are in progress with other fungicides and also to ascertain whether the fungicide can, in fact, be dispensed with altogether. Roots carrying superficial mycelium are not treated with copper sulphate; scraping and laying bare are considered sufficient. The collar and upper part of the lateral roots are left bare permanently, the author having obtained convincing evidence that roots exposed to the light

remain free from decay. Leaving the holes open also reduces labour costs and the risk of mechanical injury and consequent attack by *A. mellea*.

Potentially contagious stumps bearing sporophores are not uprooted, as they are far too numerous (about 100 per ha.) but all organic debris that can spread infection is removed.

Trees the tap-roots of which show only a small area of infection (not more than one-third the circumference) are not removed, the diseased area being cut out and the wound disinfected with powdered copper sulphate.

While it is as yet too early to say that these methods have completely justified themselves, they have already quite definitely arrested the spread of the disease in young rubber plantations.

WALLACE (T.). **Recent developments in methods of diagnosing mineral deficiencies of crops.**—*J.R. agric. Soc.*, cvii, pp. 122–133, 2 pl., 1 diag., 1946.

Reviewing recent developments in methods of diagnosing mineral deficiencies in crops [*R.A.M.*, xxiv, pp. 287, 337; xxv, p. 197; xxvi, p. 353] the author concludes that, in the hands of trained specialists, these methods provide the means of detecting deficiency of any mineral element at present known to be essential to crop nutrition.

Practical soil sterilization with special reference to glasshouse crops.—*Bull. Minist. Agric., Lond.*, 22, iv+22 pp., 11 figs., 3 diags., 1947. 1*s.* 3*d.*

The fourth edition [cf. *R.A.M.*, xxi, p. 97] of this bulletin with the same title has been prepared by a committee under the chairmanship of Dr. W. F. Bewley. New matter includes the 'Cheshunt' and 'John Innes' methods of sterilizing small quantities of soil by steaming. A method of sterilizing by electricity is also described together with general instructions for sterilizing with chemicals.

MIDDLETON (J. T.). **Root rot of condiment Sage.**—Abs. in *Phytopathology*, xxxvii, 5, p. 363, 1947.

A sage (*Salvia officinalis*) planting grown for seed in the Imperial Valley of California contained stunted, wilted plants with ashen-green leaves, discoloured fibrous roots with a water-soaked, flaccid cortex, and longitudinal, sunken, dark brown to black lesions on the longer primary and secondary roots, often girdling them. Infection usually proceeds upwards for 2 to 4 in. above soil-level, causing cortical necrosis and discoloration of the exterior of the stem stele. The disease is most in evidence in poorly drained, low-lying sites with stagnant irrigation water. Isolations from infected material collected in February, 1946, yielded *Phytophthora parasitica*, which also developed, together with *Pythium aphanidermatum*, in the March samples, while the latter only was present in those of May. Both fungi, singly and jointly, induced the typical symptoms of the disease on inoculation into sage plants.

CRANDALL (B. S.). **A new Phytophthora causing root and collar rot of Cinchona in Peru.**—*Mycologia*, xxxix, 2, pp. 218–223, 1947.

A virulently pathogenic *Phytophthora* named *P. quininea* n.sp., causing root and collar rot and often top die-back of *Cinchona* trees and seedlings, has been reported from two localities in the upper Ucayali River basin in Peru [*R.A.M.*, xxiv, p. 289]. In *C. officinalis* and *C. succirubra* the first symptom is a reddish tint of the leaves followed by wilt and leaf-fall. In the collar region a swelling appears above the invaded tissue. Internally the invasion is marked by reddish-brown wedge-shaped areas. The pathogenicity has been proved by inoculation into Ledger form *C. officinalis* and *C. succirubra* trees. *C. calisaya* and *C. micrantha* are also susceptible to the disease. *P. quininea* is described as having hyphae 3·7 to 8 μ, but mostly 8 μ in diameter. Vegetative growth is luxuriant and cotton-like on oatmeal agar.

The sporangia, formed prolifically in running brook water, are non-papillate, ovate to obpyriform, widest near the base, and 45·9 to 67·5 by 25·5 to 37·5 μ, germinating in water, usually by discharge of 14 to 20 globose to ellipsoidal zoospores 8 to 10 μ in diameter. The simple sporangiophores are up to 75 μ long and the sporangia proliferate internally. Abundant spherical, dark brown, terminal and intercalary chlamydospores 45 to 90 μ and abundant irregular vesicles are produced. The subspherical to spherical, hyaline to faint yellow, smooth oogonia are 67·5 to 82·5 μ in diameter; the oospores are spherical, hyaline to faint yellow, granular, and 48·7 to 63·7 μ; the antheridia paragynous and irregular.

The species resembles *P. cambivora* and *P. cinnamomi* in the production of chlamydospore-like vesicles but they are not in grape-like clusters as in *P. cinnamomi*. It differs from all the non-papillate types except *P. megasperma* in producing large oogonia with paragynous antheridia. It differs from *P. cinchonae* in that the latter has smaller sporangia with flattened papillae produced both terminally and laterally on short sporangiophores, and has no chlamydospores or oogonia. *P. cinchonae* also has a lower minimum growth temperature (10° C.) and a higher optimum (30°). *P. quininea* grows best on maize meal agar at pH 6, the optimum temperature being 25° and the range 15° to 30°.

Keyworth (W. G.). **Verticillium wilt of Hops. A review of research to 1946.**— *Brew. Tr. Rev.*, lxi, 729, pp. 100–103, 3 figs., 1947.

The writer briefly reviews the history of research on the hop wilt caused by *Verticillium albo-atrum* from the time of its discovery by R. V. Harris [*R.A.M.*, vi, p. 579] until 1946 [ibid., xxv, pp. 140, 141]. The present position with regard to control is that the planting of resistant varieties, e.g., OR 55 and OJ 47 [ibid., xxiv., p. 205], still offers the best prospect of speedy elimination of the disease, but other possibilities are under investigation.

Karling (J. S.). **Brazilian Chytrids. X. New species with sunken opercula.**— *Mycologia*, xxxix, 1, pp. 56–70, 56 figs., 1947.

Continuing his studies on Brazilian chytrids [*R.A.M.*, xxv, p. 475], the author describes three new saprophytic species, *Karlingia granulata*, *K. spinosa*, and *K. hyalina*, isolated from soil samples collected in the Amazon Valley. *K. rosea* [ibid., xxiv, p. 35] was found in all soil samples examined from Brazil.

Kuhnholtz-Lordat (G.). **Les Urédinées corbiculées** [Corbiculate Uredinales.]— Reprinted from *Bull. Acad. Montpellier*, 2 pp., 1941. [Received July, 1947.]

The author has presented this note in an attempt to clear up the confusion relating to the paraphyses of the Uredinales and to correct the erroneous interpretation of paraphysate teleutosori. In the uredosori the paraphyses are hyaline and thin-walled, and their shape varies with the species. They are usually intimately mingled with the uredospores, but in some cases they form a true concave crown enclosing the entire sorus (e.g., *Puccinia sonchi*). In the teleutosori the organs commonly called paraphyses are brown and thick-walled; only the dimensions and degree of differentiation vary with the species. They are always arranged at the periphery of the sorus, are closely welded together and strongly concave and rigid. Usually they are united to the inner walls of the epidermal cells which persist (covered sorus). They are true corbiculae [see next abstract]. Error of interpretation arises from the fact that these brown corbiculae can become united, with the result that when a transverse section is made, the welded edges look like brown paraphyses arising from among teleutospores.

The author considers that the corbicula is a highly differentiated apparatus of a significance entirely different from that of the paraphyses and can be interpreted as a protective apparatus for the teleutospores. Together with the persistent

epidermis of the host they form what is really a little box. When the leaves, which are often packed with them, are shed the sorus is able to resist microbic disaggregation. This entails late germination of the teleutospores, in contrast to the immediate germination of unprotected teleutospores (e.g., *P. arenariae* on *Melandrynum pratense*). The term 'paraphyses' should be confined to the sterile hyaline organs of the hymenium.

KUHNHOLTZ-LORDAT (G.). **Essai de biologie des sores du diplonte chez les Urédinées.** [An essay on the biology of the sori of the diplont in the Uredinales.]—*Bull. Soc. mycol. Fr.*, lix, pp. 78–155, 40 figs., 1944. [Received July, 1947.]

The author analyses in detail the development, structure, function, and dehiscence of the uredo- and teleutosori, and the spore dissemination of the Uredinales, with precise definitions of the terms used. The sorus of the diplont when highly differentiated consists of a stroma, a sporogenous mat which produces the spores and paraphyses, a 'corbicula' (corbeille) [see preceding abstract], and the teguments of the [host] matrix, which afford protection to sporogenesis.

The paraphyses are related to the function of the uredosorus which is essentially the dissemination of the multiplicative phase (uredospores); the 'corbicula' is connected with the function of the teleutosorus, namely, the dissemination of the resting spores.

Highly differentiated corbiculae are found in the different families of the Uredinales. Rigid corbiculae, often incurved as a cover over the stroma, induce marked modifications in the spores, which become deformed ('baroques'), but may remain unicellular (mesospores); beneath the median part of the sorus, the pressure being less, the spores are normal (symmetrical).

In considering the systematics of Uredinales some account should be taken of the structure of the sori. Biometrical criteria are apt to be unreliable; the peduncles measured during the retarded stage of teleutosorus development may be shorter than at the moment of dissemination. The brachysporous and dolichosporous forms may vary in number both in time and space. Before attempting to establish systematic affinities by means of measurements the sori should be compared as completely as possible. New possibilities of classification exist in the study of the stromata.

KUHNHOLTZ-LORDAT (G.). **Sur un mode de formation des 'conidies' d'Urédinées (rouille du Mahonia).** [On a mode of formation of the 'conidia' of Uredinales (*Mahonia* rust).]—*Bull. Soc. mycol. Fr.*, lx, pp. 47–51, 8 figs., 1944. [Received July, 1947.]

The barberry rust [*Cumminsiella sanguinea*: *R.A.M.*, xiii, p. 185] has a very complex apparatus for uredospore emission consisting of a small aseptate column, which as it grows emits from the apex uredospores and produces numerous non-deciduous paraphyses in which the column remains enveloped along its entire length. The column itself is comparable to a conidiophore. The term 'uredospore' therefore seems open to criticism from several points of view, particularly the absence of chromosome reduction, and should be replaced by 'uredoconidium'.

The systematic position of the rust has been much discussed. The present tendency appears to be against separating it from *Puccinia*, this genus being taken to include all species with two-celled teleutospores. The author considers, however, that the shape and manner of formation of the uredospores and the special nature of the teleutospore wall justify the splitting up of the genus. The justification for having the genus *Tranzschelia*, for example, lies much more in the mode of reproduction of the diplont than in the form of the teleutospores, e.g., *P. prunispinosae*. Those who admit as much will find equally good reasons for abandoning Peck's binomial, *P. mirabilissima*, for the barberry rust. The author considers that the

structure of the sori is of more systematic importance than the morphology of the spores [see preceding abstracts].

In a footnote it is stated that the rust is spreading in the vicinity of Montpellier. Locally, teleutospores are uncommon, though some were found in the uredosori about the middle of April; [uredo]conidia are emitted throughout the year.

SĂVULESCU (T.). **Matériaux pour la flore des Urédineés de Roumanie. Supplément.** [Materials for the flora of the Uredinales of Rumania. Supplement.]—*Bull. Sect. sci. Acad. roum.*, xxvi, 5, pp. 308–332, 2 figs., 1944. [Received 1947.]

This further contribution to the author's studies on Rumanian rusts [*R.A.M.*, xxvi, p. 316] brings the total number of species known to occur in the country to 367 and the number of hosts to 697. Among the ten species and three forms new to Rumania is *Puccinia coronata* f. sp. *alopecuri* and f. sp. *agrostis*.

THIRUMALACHAR (M. J.). **Some noteworthy rusts. II.**—*Mycologia*, xxxix, 2, pp. 231–248, 18 figs., 1947.

A description is given of a second collection of rusts from south India [cf. *R.A.M.*, xxv, p. 11; xxvi, p. 266]. Those reported on the leaves of hosts of economic importance are *Puccinia exhauriens* on *Jasminum* sp., *P. phyllocladiae* on *Asparagus* sp., *Uredo celastri* on *Celastrus paniculata*, and *Mainsia pterocarpi* n.sp. on *Pterocarpus marsupium*, an important timber tree in the forests of Mysore, which sometimes suffers severe defoliation from the rust. The uredosori are hypophyllous on indistinct infection spots. The subglobose to spherical, pale yellow uredospores are borne singly on pedicels, and are 12·5 to 15 by 10 to 12·5 μ. The teleutosori are minute, and the teleutospores hyaline, unicellular, and pedicellate with four to six spores in a cluster on a sporogenous basal cell. They are clavate to cylindric, broader at the apex, rounded, and 21 to 30 by 10 to 12·5 μ; the epispore is thin, hyaline, and smooth.

KERN (F. D.) & WEST (E.). **Another Gymnosporangial connection.**—*Mycologia*, xxxix, 1, pp. 120–125, 1 plate, 1947.

The authors report the discovery of the perfect state of *Roestelia hyalina* in a new *Gymnosporangium* on *Chamaecyparis thyoides* collected near Bristol, Florida, and in South Carolina. *Chamaecyparis* grows in all the parts of North and South Carolina and Florida where *R. hyalina* occurs on *Crataegus* spp. Cultures from both the Florida and South Carolina specimens inoculated on a *Crataegus* sp. in the greenhouse in Pennsylvania gave *R. hyalina*. Cultures from the Florida specimens gave similar results on *C. rimosiformis* and *C. uniflora* at Gainesville, Florida.

The combination *G. hyalinum* was used hypothetically in 1911 for the presumed perfect state of *R. hyalina*, and a description is now supplied which makes the name valid. The pycnidia are epiphyllous. The hypophyllous aecidia, occurring on small, pyriform, gall-like protuberances, are consolidated at the bases, cylindric, 2 to 5 mm. high, tardily rupturing along the sides, somewhat distorted but not recurved, the peridial cells lanceolate, remaining straight when wet, the outer wall 12 to 16 μ thick, the inner and side ones 3 to 4 μ, smooth on all surfaces. The globoid, pale cinnamon-brown aecidiospores are 2 to 3 μ wide, finely verrucose, with 6 to 8 pores. The teleutosori are caulicolous, pulvinate, scattered or aggregated, varying in shape and size, 1 to 5 mm. across, light chocolate-brown; the 2-celled, ellipsoid teleutospores, slightly constricted at the septum, measure 16 to 21 by 40 to 63 μ; the golden-brown wall is 1 to 1·5 μ thick, up to 4 μ at the apex; pores one in a cell, apical; pedicels cylindrical, 3 to 5 μ in diameter, moderately long.

The aecidial stage occurs on *Crataegus* spp. and *Pyrus communis* × *P. pyrifolia*.

Moreau (C.). **Une Sphaeropsidale nouvelle sur les gousses d'Albizzia Lebbek Benth.** [A new member of the Sphaeropsidales on the pods of *Albizzia lebbek* Benth.].—*Rev. Mycologie, Suppl. colon.*, xi, 1, p. 29, 1 fig., 1946.

On the pods of *Albizzia lebbek* [*R.A.M.*, xvi, p. 786] gathered at Dakar an abundance of round, smooth, dark brown, erumpent pycnidia was noticed; each 70 to 130 μ high and 100 to 200 μ in diameter with round stomatal openings 8 to 10 μ wide. The spores on short stalks are hyaline, biguttulate, elongate-ellipsoid or rarely ovoid, and measure 4 to 5 by 2 to 2·5 μ. The fungus has been named *Phoma albizziae* n.sp. [without a Latin diagnosis]. It is the first *Phoma* sp. to be recorded on *Albizzia*; it is similar to *P. leguminum* but is distinguished by its very small, delicate spores.

Garner (W. W.). **The production of Tobacco.**—xiii+516 pp. 75 figs., 2 diags., 3 graphs, 1 map, Philadelphia, The Blakiston Company, 1946. $6.00.

The present volume is designed for the use of students in agricultural colleges and universities, and for agricultural workers requiring a broad background of information on the fundamentals of tobacco production. With these needs in view, the author has sought to provide a concise, reasonably comprehensive survey of the essential features of tobacco production and its problems. Chapter XIII deals with the diseases of the crop and their control and XVII with the mineral nutrition of tobacco, including various deficiency disorders.

Oster (G.), Doty (P.M.), & Zimm (B. H.). **Light scattering studies of Tobacco mosaic virus.**—*J. Amer. chem. Soc.*, lxix, 5, pp. 1193–1197, 6 graphs, 1947.

Light-scattering measurements were made on a freshly prepared sample of purified tobacco mosaic virus, in which the length of the particles, determined from dissymmetry of light scattered by the solutions, was found to be 270 mμ [*R.A.M.*, xxvi, p. 268]. Application of the dissymmetry method to turbidity measurements gave a weight-average molecular weight of 40,000,000 for the particles. These values are in complete agreement with sizes determined from electron microscope and viscosity studies made on the same sample, indicating the validity of the light-scattering technique.

For dilute solutions of tobacco mosaic virus in water the dissymmetry decreases with rising virus concentration, denoting the occurrence of strong interaction with a consequent increase in order of the scattering particles. However, the dissymmetry is independent of concentration for dilute solutions of the virus in 0·1 *M* sodium phosphate buffer at pH 7.

Smith (T. E.). **D-D mixture as a soil treatment for bacterial wilt on Tobacco.**—*Phytopathology*, xxxvii, 5, p. 371, 1947.

Applied on 8th March, 1944, to holes in the soil of plots 12 by 24 ft. with watertight sidewalls, commercial D-D mixture, at dosages of 2, 4, and 8 ml. per sq. ft. soil surface, reduced the incidence of tobacco bacterial wilt (*Bacterium* [*Xanthomonas*] *solanacearum*] [*R.A.M.*, xxiii, p. 460] in a susceptible variety planted on 1st June from 82 to 59, 24, and 0 per cent., respectively. The same plots, replanted with susceptible tobacco without further treatment, showed 71, 73, and 11 per cent. wilt, respectively on 1st August, 1945, as against 83 per cent. in the controls. At the heavier rates the fumigant induced, in the 1944 crop, the foliar darkening, brittleness, and upward rolling of the margins typical of excessive chlorine.

Heuberger (J. W.). **Suggestions on planning Tomato disease control programs.**—*Food Packer*, xxviii, 7, pp. 59–61, 1947.

The following are some of the suggestions offered to growers and canners who

are considering a tomato disease control programme by the use of fungicides, aiming chiefly at the elimination of early and late blights [*Alternaria solani* and *Phytophthora infestans*: *R.A.M.*, xxvi, p. 269] and anthracnose [*Colletotrichum phomoides*: ibid., xxvi, p. 360]. Spraying was found to be more effective than dusting over the three-year experimental period 1944–46 in Delaware, and ground superior to aeroplane dusting. For the eastern and mid-western States the programmes recommended are (*a*) dithane Z–78 or parzate (both being brands of zinc ethylene bisdithiocarbamate), (*b*) an alternating schedule of zerlate or one of the foregoing and tribasic copper sulphate or other fixed copper compound, (*c*) zerlate for the first few treatments followed by Bordeaux or fixed copper if late blight threatens, and (*d*) various fixed coppers, e.g., copper compound A, tribasic, copper oxychloride sulphate, and yellow cuprocide. A minimum of three applications should be made, the first at 'breaking' and the second and third at approximately ten-day intervals. Attention should be paid to planting in long, narrow strips, enabling an orchard sprayer to be used, and wider spacing of the rows, setting the plants closer together.

Mills (Margaret M.) & Hutton (E. M.). **Fusarium wilt of Tomato in Australia. 1. The relationship between different isolates of the pathogen and resistance in varieties of Lycopersicon esculentum Mill. and other Lycopersicon species.**—*J. Coun. sci. industr. Res. Aust.*, xix, 4, pp. 376–386, 1946.

Tomato wilt (*Fusarium bulbigenum* var. *lycopersici*) [*R.A.M.*, xxvi, pp. 83, 176] is productive of economic losses in North Queensland and the Northern Territory, and on sandy soils in South and Western Australia. In a study of susceptibility and resistance different tomato varieties from Australian and overseas sources were tested in the greenhouse against ten isolates of the fungus that had been proved to be highly pathogenic to Bonny Best. The result showed that the only highly resistant variety (no wilted plants) was Pan America. Field observations confirmed this result, no instance of infection having been found in Australia on this variety. Apart from this, one group of varieties developed about 100 per cent. severely wilted plants, a second group 60 to 90 per cent., and a third only 30 to 50 per cent. The opinion is expressed that under different environmental conditions the varietal reactions might indicate differing degrees of susceptibility in any one variety. For example, the third group contains such varieties as Break o' Day, Pearson, Rutgers, Denisonia, Riverside, and Recruit, which have shown good field resistance in Northern Territory and Queensland.

Further greenhouse inoculation tests demonstrated that the lines of *Lycopersicon pimpinellifolium* used were all highly resistant to the isolates employed. Two lines of *L. peruvianum* were, respectively, highly resistant and resistant, *L. hirsutum* was resistant, and *L. pissisi* only moderately so.

From these results it can be assumed that most lines of *L. pimpinellifolium* are highly resistant to the strains of the fungus usually found in Australia and appear to be the best source of genes conferring high resistance. As, however, Pan America evidently possesses these genes, in practical breeding work under local conditions this variety can be used as a source of resistance in crosses with susceptible varieties. That the high resistance of Pan America is transferred to the progeny of crosses with susceptible varieties is demonstrated in a subsequent paper.

When 1,200 plants of 30 different varieties were inoculated with two different isolates of the fungus (half of the plants of each variety with one isolate and half with the other), one set showed 40 per cent. non-wilted plants, the other 27 per cent., indicating a difference in pathogenicity between them. Further work using 10 isolates on 12 varieties definitely suggested that under Australian conditions strains of the wilt fungus are present that show different degrees of pathogenicity, though such differences are not substantial. These tests also showed that Pearson

29–17 (an improved selection of Pearson from California) was significantly more resistant than Pearson.

Foster (R. E.) & Walker (J. C.). **Predisposition of Tomato to Fusarium wilt.**—*J. agric. Res.*, lxxiv, 5–6, pp. 165–185, 5 figs., 8 graphs, 1947.

The purpose of this investigation was to determine in what way and to what extent certain factors in the environment influence the predisposition of tomatoes to wilt (*Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici*) [*R.A.M.*, xxv, p. 478 and preceding abstract].

Three varieties were used, the very susceptible Bonny Best, the intermediate-resistant Marglobe, and the highly wilt-resistant *Lycopersicon pimpinellifolium*. They were grown free from the wilt organism for a period of from 30 to 50 days under environmental conditions which were near the optimum for vigorous growth except for the variation of a single predisposing factor. At the end of the predisposing period all plants were inoculated with a virulent strain of *F. bulbigenum* var. *lycopersici*. All the plants were then maintained as near as possible to the optimum conditions for the development of wilt. Those plants of Bonny Best and Marglobe predisposed at 28° C. soil temperature wilted most severely, those at 20° and 36° less so, and least at 12°. Bonny Best predisposed at 20° and Marglobe at 28° showed approximately the same degree of susceptibility. The two varieties were most effectively predisposed to wilt at 28° air temperature, less so at 24° and 20°, and least at 16°. Again the reactions of Bonny Best predisposed at 20° and Marglobe at 28° were similar. These results showed that temperatures most favourable to the growth of tomatoes were also most favourable to wilt, and that the effect of air temperature alone was somewhat less pronounced than that of soil temperature alone in predisposing the plants to wilt.

Predisposed at different soil moisture levels, Bonny Best and Marglobe both wilted in dry soil (15 per cent. of wet weight), whereas very wet soil (37 per cent.) decreased their potential susceptibility. Effective predisposition to wilt was achieved in both by allowing only six hours' daylight each day. Plants were grown under low or high light intensities of approximately 90 or 800 foot-candles, respectively, furnished by sunlight supplemented with artificial light. Those receiving less light were predisposed to wilt to a greater degree than those grown under light of high intensity.

Predisposition most favourable to subsequent wilt in both varieties was obtained by low nitrogen, high potassium, or low phosphorus concentration [ibid., xxv, p. 424] as compared with the balanced solution or with high nitrogen, low potassium, or high phosphorus, respectively. Decrease in potential susceptibility to wilt was found to have been conditioned in the plants by the solutions in the following order: low phosphorus (most susceptible), low nitrogen, high potassium, balanced solution, high phosphorus, low potassium, high nitrogen (least susceptible). Both Bonny Best and Marglobe grown in nutrient solutions of low pH were more susceptible, and those in high pH less susceptible than those grown in the solution at pH 6·5 to 7. Age of plant at the time of inoculation had no marked effect upon wilt development. Both Bonny Best and Marglobe are thus predisposed to wilt by the same environmental factors and apparently in the same manner. Resistant plants were made to appear susceptible, and normally susceptible ones to appear resistant by proper control over the external environment prior to inoculation. The highly resistant Red Currant tomato remained immune under all conditions.

Stevenson (J. A.) & McColloch (L. P.). **Myrothecium as a Tomato fruit rot organism.**—*Plant Dis. Reptr*, xxxi, 4, pp. 147–149, 1947. [Mimeographed.]

Plant quarantine inspectors have sometimes intercepted at Texas border stations

tomato fruits from Mexico with a rot due to a species of *Myrothecium* [*R.A.M.*, xxiii, p. 191]. They each bore one to several lesions which were dark brown to black, roughly circular to oval, flattened to slightly depressed, 1 to 3 cm. in diameter, somewhat zonate, especially after sporodochia formation, and sharply demarcated. The rot penetrates deeply into the fruit and forms a firm lump, which can be easily removed. The fungus produces sporodochia readily in circular bands, finally covering most of the lesions, the growth being greenish to black with a narrower band of white mycelium typical of the genus. It is easily isolated and grows and fruits on several standard media. It is a narrow-spored type and can be definitely referred to *M. roridum*. Puncture inoculations on greenhouse tomatoes at the Plant Industry Station at Beltsville produced characteristic fruiting lesions. This tomato disease seems to appear only sporadically, and little is known about the factors necessary for fruit infection in the field.

W. H. Tisdale described in 1916 a greenhouse tomato disease in Wisconsin, the so-called '*Melanconium*' ring rot [ibid., xvi, p. 70]. His description and illustrations of the causal fungus can be interpreted readily as *Myrothecium* and the conidia described by him correspond with those of *M. verrucaria*. Some of Tisdale's original preserved specimens were examined. The lesions were quite typical of those observed on the Mexican specimens, but unfortunately no conidia or other evidences of the *Melanconium* were found. Nevertheless the authors are certain that the causal agent of Tisdale's disease was a species of *Myrothecium*, apparently *M. verrucaria*.

W. L. White, reporting at the recent Boston meeting of the Mycological Society of America, pointed out that the so-called *Metarrhizium glutinosum* [ibid., xxvi, p. 163], widely used in recent years as a test organism in studies of fibre deterioration, is to all intents and purposes *Myrothecium verrucaria* [*sensu* Preston].

Moreau (C.). **Sur le Gloeosporium kaki Seiya Ito.** [Concerning *Gloeosporium kaki* Seiya Ito.]—*Rev. Mycologie*, N.S., x, 5–6, pp. 125–127, 5 figs., 1946.

Gloeosporium kaki [*R.A.M.*, xxvi, p. 270], isolated from the fruits of *Diospyros lotus* and the shells of walnuts (*Juglans regia* and *J. nigra*) grown at Caen, has been reported previously only from Japan [ibid., xvi, p. 410] and Italy and on persimmon (*D. kaki*). The development and cultural appearance of the fungus, and conidial germination are described. The conidiophores arise either separately or massed in sporodochia.

Weiss (F.) & St. George (R. A.). **Culture, diseases, and pests of the Box tree.**—*Fmrs' Bull. U.S. Dep. Agric.* 1855, 18 pp., 9 figs., 1 map, 1947.

This is a slightly revised version of the bulletin with the same title published in 1940 [*R.A.M.*, xx, p. 434].

Campbell (W. A.). **A new species of Coniothyrium parasitic on sclerotia.**—*Mycologia*, xxxix, 2, pp. 190–195, 1 fig., 1947.

Coniothyrium minitans n.sp., parasitizing the sclerotia of *Sclerotinia sclerotiorum* on guayule [*Parthenium argentatum*] near Salinas, California [*R.A.M.*, xxvi, p. 169], and from Brussels sprouts near Carmel, has been obtained in pure culture. It is described as having superficial, globose, smooth, carbonaceous pycnidia 200 to 700 μ in diameter. The pycnidiospores exude as a black liquid mass from a central ostiole; they are brown, ellipsoid, smooth or minutely roughened with age, and 4 to 6 by 3·5 to 4 μ. They germinate readily on potato dextrose or water agar, forming a mat surface covered with dark pycnidia. The fungus grows best at 20° C. Inoculation experiments showed that suspensions of *C. minitans* readily parasitized and disintegrated sclerotia of *S. sclerotiorum* and *S. minor* which formed

a good basis for pycnidial development. In one experiment the formation of apothecia from sclerotia of *S. sclerotiorum* in sterile sand was suppressed when pycnidiospores of *C. minitans* came into direct contact with sclerotia and when they were poured on the sand. From these experiments it seems that there is a possibility of *Sclerotinia* spp. being controlled biologically by *C. minitans*.

Chorin (Matilda). **Downy mildew on Cauliflower curds.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 258–259, 2 figs., 1946. [Hebrew summary.]

Downy mildew of cauliflower curds (as distinct from the plants) caused by *Peronospora brassicae* [*P. parasitica*: *R.A.M.*, xxiii, p. 247] was first observed in Palestine in 1940, the localities affected including the coastal zone, western Galilee, and the Esdraelon and Jordan Valleys. The disease is particularly noticeable on heads kept on for seed production and their development is arrested. The yellowish-white spots extend some distance down into the interior of the head. Black dots and elongated depressions develop over the entire infected area. Diseased plants may be simultaneously attacked by *Xanthomonas campestris* [ibid., xxiv, p. 301] and *Alternaria*, which induce more rapid decay of the head.

Hull (R.) & Wilson (A. R.). **Distribution of violet root rot (Helicobasidium purpureum Pat.) of Sugar Beet and preliminary experiments on factors affecting the disease.**—*Ann. appl. Biol.*, xxxiii, 4, pp. 420–433, 1 pl., 1946.

Examination of sugar beets grown in eastern England over the period 1936–43 demonstrated that up to 5 per cent. of factory tarehouse samples contained roots infected by *Helicobasidium purpureum* [*R.A.M.*, xxv, pp. 149, 203]. The evidence indicated that there are considerable areas where light attacks occur, as well as fields where severe outbreaks develop when susceptible crops are grown. The disease was most frequent on roots from light alkaline soils. It reduced the sugar content by 1 to 2 per cent. and doubled the dirt tare of the beets. Clamping a crop with a small number of diseased roots entails no spread in periods up to 2½ months; with 10 per cent. or more diseased roots severe losses may result.

Observations suggested that *H. purpureum* persists in the field on weeds. Severe outbreaks are frequently associated with weedy fields. The fungus also survives as sclerotia, which develop freely on the roots of susceptible crops. Good cultural practices, trap cropping, and the use of nitrogenous fertilizers act as a check, even when susceptible crops are grown consecutively. Wet soil conditions did not favour infection, but may, perhaps, favour sclerotial survival as the disease may occur frequently in wet places.

Experiments with compost made from factory waste showed that although *H. purpureum* can survive the process, its virulence is so reduced that the use of such compost is unlikely to cause severe infection.

Although rotation with non-susceptible crops is a measure for reducing soil infectivity this does not invariably follow and it appears that there are factors involved in cultivation practices which lead to greatly reduced infectivity even when a succession of susceptible crops is grown.

Middleton (J. T.) & Snyder (W. C.). **The production of Ascochyta-free Pea seed in southern California.**—Abs. in *Phytopathology*, xxxvii, 5, p. 363, 1947.

Pea seed free from infection by *Ascochyta* [spp.] has been produced from naturally and artificially contaminated Little Marvel, naturally infected Alaska, and inoculated No. 76 seed in the Imperial and Temecula Valleys of southern California. In the latter locality the peas were grown during the dry summer period and in the former, where the average rainfall from August to the end of December totals

1·19 in. and from November to March 1·64 in., during the winter and late spring. At no time throughout the three years covered by the investigation were aerial blight symptoms observed in any of the plantings, while plants raised from healthy seed sown in ground cropped with peas for the last 23 years showed neither below- nor above-ground infection by *A. pisi*.

Leach (L. D.) & Snyder (W. C.). **Localized chemical applications to the soil and their effects upon root rots of Beans and Peas.**—Abs. in *Phytopathology*, xxxvii, 5, p. 363, 1947.

Of the chemicals so far tested [? in California] for the prevention of root rot of beans [*Phaseolus vulgaris*] caused by *Rhizoctonia* [*Corticium*] *solani*, *Fusarium solani* f. *phaseoli*, and *Thielaviopsis basicola*, and peas (*C. solani*, *F. solani* f. *pisi*, and *Ascochyta* spp.), 25 per cent. dithane D14, applied to the row when sowing, has proved the most effective. Used at the rate of 1 gal. (or 2 lb. of the dry powder, dithane A10) per acre the fungicide caused substantial reductions in the incidence of the disease.

Mackie (W. W.), Snyder (W. C.), & Smith (F. L.). **Production in California of Snap-Bean seed free from blight and anthracnose.** *Bull. Calif. agric. Exp. Sta.* 689, 23 pp., 1 map, 1945. [Received July, 1947.]

In the United States the greatest losses among beans [*Phaseolus* spp.] are caused by anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, xxiv, p. 350] and bacterial blight (*Bacterium* [*Xanthomonas*] *phaseoli* [ibid., xxvi, p. 92], *Bact.* [*Pseudomonas*] *medicaginis* var. *phaseolicola* [ibid., xxvi, p. 373], and *Bact.* [*Corynebacterium*] *flaccumfaciens* [ibid., xxv, p. 89]).

As these diseases are seed-borne, attempts have been made to control them by various seed treatments, and also by the application of dusts and sprays in the field and by introducing resistant varieties [ibid., xxvi, p. 325]. All these methods, however, are ineffective in humid areas. The best control method so far has been by the use of disease-free seed [ibid., xxvi, p. 372] coupled with crop rotation. The diseases do not occur in bean-seed crops grown in California during the dry summer. The area with almost rain-free summers seems to be adequate to meet all demands of the United States for snap-bean seed free from these diseases. Other advantages of California-grown seed are the low incidence of seed-borne mosaic and of field hybridization. Bean seed grown in California is more expensive than seed from other States, but the absence of disease in the crop more than compensates the higher cost.

Barry (J. P.). **Une grave maladie de la Fève (Botrytis fabae Sardiña).** [A serious Broad Bean disease (*Botrytis fabae* Sardiña).] - *Progr. agric. vitic.*, cxxvii, 15–16, pp. 290–291, 1947.

Attention is drawn to the symptoms and control of chocolate spot of broad beans (*Botrytis fabae*) [*R.A.M.*, xxv, p. 247; xxvi, p. 110], which is reported for the first time in France on plants from Saint-Bauzille-de-Putois.

Ogilvie (L.) & Munro (M[oira D.]). **Occurrence of Botrytis fabae Sardiña in England.**—*Nature, Lond.*, clx, 4055, p. 96, 1947.

Chocolate spot (*Botrytis fabae*) [see preceding abstract], hitherto reported only from Spain, Morocco, Cyprus, Egypt, and China, has now occurred [on broad beans] in south-west England. It is readily distinguished from *B. cinerea* on beans, common in eastern England, by its larger spores and smaller sclerotia.

Booer (J. R.). **Further experiments on the control of white rot (Sclerotium cepivorum Berk.) in Onions, Shallots, and Leeks.**—*Ann. appl. Biol.*, xxxiii, 4, pp. 413–419, 3 figs., 1946.

In further work on the control of *Sclerotium cepivorum* [*R.A.M.*, xxv, p. 90] in spring-sown onions, the application of 1 lb. 4 per cent. calomel [mercurous chloride] dust per 50 yds. seed drill at sowing gave adequate control in salad onions. Broadcasting 1 oz. 4 per cent. calomel dust per sq. yd. before sowing was less effective. Post-emergence application of the dust gave no control. In autumn sowings seed-drill treatment at 1 lb. per 50 yds. controlled infection the following spring but caused severe retardation and loss of crop. Onion seedlings raised in heat and dipped in an aqueous paste of calomel dust (480 gm. in 210 ml. water) before being transplanted showed high resistance to a severe outbreak, while similar treatment of shallot bulbs was also effective. In both cases the treatment substantially increased yield and to some extent reduced storage losses.

Middleton (J. T.) & Yarwood (C. E.). **Fungicidal control of Cantaloupe powdery mildew.**—*Bull. Calif. agric. Exp. Sta.* 697, 8 pp., 4 figs., 1946.

In 1938 a new biological race of melon powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, xxv, p. 24] appeared in California, to which No. 45, a previously resistant cantaloupe, was highly susceptible. Since 1938 three new resistant varieties, Nos. 5, 6, and 7, have been introduced [ibid., xxiv, p. 216], but there is always the possibility that strains of the fungus will appear to which these new types are also susceptible. Fungicidal control is therefore important.

Extensive spraying and dusting experiments have been conducted on a commercial scale over a period of years in the Imperial Valley. The collective result, expressed as percentage reductions in mildew, for the different spray materials, all used with triton B–1956 spreader (6 oz.–100), were as follows: Bordeaux mixture (2–2–100) 91, bordelo (2 per cent. copper ammonium carbonate) 94, Burgundy mixture (1·5–2–100) 95, Burgundy (without spreader) 81, copper sulphate (2 oz. in 100) 68, cuprocide 95, cupro K 53, fermate 71 (all at 1·5 in 100), spergon (0·75–100) 89, spraycop (1·5–100) 72, wettable sulphur (3 in 100) 100, liquid lime-sulphur (0·1 per cent.) 60, (0·3 per cent.) 98, the latter followed by cuprocide 93, or followed by Bordeaux 94.

Wettable sulphur caused injury to the plant, as did 0·3 per cent. lime-sulphur at 95° F. and above. Burgundy is more easily applied than Bordeaux and, together with other copper sprays, is thought to be as good as cuprocide for the second application. Cuprocide has been used successfully on a large scale by the growers. For early plantings 0·3 per cent. lime-sulphur followed by cuprocide is recommended for general use. For medium and late plantings one application of a copper spray will usually be sufficient. The first spray should be applied when one to five mildew spots per leaf are found on the lower surfaces of the crown leaves. The second should follow when mildew again increases to the same degree of severity.

Duvdevani (S.), Reichert (I.), & Palti (J.). **The development of downy and powdery mildew of Cucumbers as related to dew and other environmental factors.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 127–151, 2 figs., 1 diag., 1946. [Hebrew summary.]

The effect of the presence or absence of dew on the development of cucumber downy mildew (*Pseudoperonospora cubensis*) was studied on the Beit Alfa variety at the Pardess Hanna Agricultural School, Karkur, in the northern part of the Palestine coastal plain [*R.A.M.*, xxvi, p. 180], on small plots, some of which were protected from dew formation by the nightly application from sunset to sunrise, between 17th June and 4th September, 1942, of canvas canopies. Most of the plots

were irrigated by furrows, but overhead pipes were used on others. Some observations on powdery mildew (*Erysiphe cichoracearum*) [loc. cit.] were included in the investigations.

Prevention of dew formation largely inhibited the development of downy mildew between 9th and 31st July, especially on the furrow-irrigated plots, on which the incidence of foliar infection was reduced from 62 to 31 per cent., the corresponding figures for the overhead series being 63 and 54 per cent. respectively. The exclusion of dew failed to prevent powdery mildew development.

The analysis of daily meteorological records in relation to observations on the appearance and spread of *P. cubensis* in the Palestine coastal plain led to the following conclusions. Cucumber leaves are liable to infection only when dew intensity reaches the level expressed by 2 to 2–3 in the Duvdevani dew scale ('Dew in relation to plants'. In preparation). During the ten-hour nights of June and July downy mildew will develop only when the nightly minima are not below 18° C. at a height of 15 cm. in the open. In the 12-hour September nights, however, infection may take place at a minimum of 16°, while at 18° the fungus spreads very rapidly. The incubation period of cucumber downy mildew was eight to ten days in June and July, and four to five in September.

Reichert (I.), Palti (J.), & Moeller (S.). **Field trials for the control of downy and powdery mildew of Cucumbers. II. The comparative efficacy of copper and sulphur fungicides.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 214–229, 1 fig., 1946. [Hebrew summary.]

In continuation of previous experiments on the control of cucumber downy and powdery mildews (*Pseudoperonospora cubensis* and *Erysiphe cichoracearum*) [*R.A.M.*, xxiv, p. 263], 13 field trials were conducted in different parts of Palestine from 1942 to 1944, mostly on furrow-irrigated plots. Dusting with various brands of sulphur gave excellent control of *P. cubensis*, against which spraying with 1·5 per cent. lime-sulphur was partially effective. *E. cichoracearum* was also amenable to the sulphur dusts, which further materially reduced the aphid population, did not seriously injure the foliage, and extended the picking season. These preparations increased the yield by up to 60 or 70 per cent. in some of the experiments, the actual gain in weight in one test amounting to 2·4 tons per 1,000 sq. m. Treatments with weak copper sprays, e.g., 0·75 per cent. Bordeaux mixture, 0·25 per cent. perenox, and 1 to 1·5 per cent. floridan, effectively combated downy mildew, but did not give such heavy yield increases as sulphur-dusting.

In the few tests carried out under overhead irrigation neither the sulphur nor the copper-containing fungicides conferred adequate protection against severe attacks of *P. cubensis*: in milder outbreaks the copper sprays were more profitable than the sulphur. Since overhead irrigation favours downy mildew development [see preceding abstract], cucumbers should be grown in furrow-irrigated plots wherever the disease tends to be serious.

Takahashi (W. N.) & Rawlins (T. E.). **An electron microscope study of Squash mosaic virus.**—*Amer. J. Bot.*, xxxiv, 5, pp. 271–272, 1 fig., 1947.

Examination of juice of Zucchini squash plants, infected with the squash mosaic virus [cucumber mosaic virus: *R.A.M.*, xxiii, p. 424], by means of the electron microscope showed that the virus consists of spherical particles with an average diameter of 30 mμ.

Raychaudhuri (S. P.). **A mosaic disease of Brinjal (Solanum melongena Linn.).**—*Curr. Sci.*, xvi, 5, pp. 149–150, 3 figs., 1947.

A mosaic disease of brinjal [eggplant] was rather widespread in 1946 at Delhi. The affected plants showed bright green mosaic mottling and puckering and

crinkling of the leaf. Occasionally fine, pale straw-coloured, concentric, irregularly shaped rings developed on the leaf. In some cases the midrib or its branches extended beyond the lamina, while in others the leaf was completely changed into a filamentous structure. The development of flowers and fruits was greatly reduced. The disease was transmitted by grafting to healthy eggplant, tomato, and tobacco plants raised in an insect-proof house.

Myzus persicae and *Empoasca devastans*, observed on diseased eggplants, were transferred directly to healthy eggplant, potato, tomato, and tobacco plants raised in the insect-proof house. All the eggplants and tomato plants on which *E. devastans* were set free showed typical symptoms of the disease in 24 to 37 days, while potato and tobacco and all four hosts on which *M. persicae* were liberated remained healthy.

The symptoms of this eggplant disease differ from those of the virus diseases of eggplants in Rumania [*R.A.M.*, xiv, p. 215; xvii, p. 581]. Further work is in progress.

Peklo (J.). **Plodnice jedlé houby v čisté kultuře.** [The fruiting body of an edible fungus in pure culture.]—*Čas. čsl. Houb.* [*J. Czech Mycol.*], xxi, 1 p., 1 fig., 1941. [Received May, 1947.]

The author isolated one of the Clavariaceae (? *Sparassis crispa*) from a rotten pine root. The fruiting bodies were easily produced on malt agar in pure culture. The fructifications were of good flavour, and the author suggests experiments to explore the possibility of growing the fungus for food.

Capoor (S. P.), Varma (P. M.), & Uppal (B. N.). **A mosaic disease of Vigna catjang Walp.**—*Curr. Sci.*, xvi, 5, p. 151, 1 fig., 1947.

In October 1942 some plants of *Vigna catjang* [*V. unguiculata*: cowpea] growing on the Agricultural College Farm, Poona, showed mosaic symptoms [*R.A.M.*, xxi, p. 514]. The leaves were malformed and dwarfed, dark green areas being interspersed with light green. At a later stage the chlorosis became severe with small green areas dispersed over the surface. The affected plants bore only a few small pods, with broad, light and dark green stripes on their surfaces and containing a few seeds each.

The virus is sap-transmissible and infection is rendered much easier by the addition of 600-mesh carborundum to the inoculum. *Aphis medicaginis* transmitted the virus to about 36 per cent. of the plants colonized with infective adults. Grown under controlled glasshouse conditions about 4 per cent. of the commercial cowpea seed produced infected seedlings. The dilution end point of the virus in crude sap lies between 1 in 50,000 and 1 in 10,000. It withstands exposure for ten minutes at 85° C., but is inactivated at 90°. Infectivity of the virus was lost after 15 days at 24°, but not after nine. The virus also infected asparagus bean (*V. sesquipedalis*), *Phaseolus lantanus* [? *lunatus*], and *Canavalia ensiformis*.

McLean has described a mosaic disease of cowpea [caused by a strain of cucumber mosaic virus: ibid., xx, p. 444] and Snyder reported a similar disease of *V. sesquipedalis* [ibid., xxi, p. 514]. The transmission by sap, seed, and aphids, and the symptoms produced on the host resemble those of the Poona disease, but the physical properties show marked differences so that the latter virus is considered distinct from cowpea and asparagus bean mosaic viruses.

Reitsma (J.) & Sloof (W. C.). **Brachysporiosis of Talinum triangulare (Jacq.) Willd.**—*Chron. Natur.*, ciii, 6, pp. 92–94, 5 figs., 1947.

This disease of *Talinum* [*T. angulare*] leaves [used for spinach and salads] caused by *Brachysporium robustum* n.sp. was first observed in the experimental vegetable garden at Moeara near Buitenzorg. The first symptoms are diminutive, slightly

raised, red-brown spots scattered over the mature leaves, and usually first visible on the lower surfaces of the leaf. The spots may enlarge to circular patches about 5 mm. in diameter, the centre becoming translucent, parchment-like and brittle, often making holes. When stalks and petioles are attacked they show elongated lesions. Sporulation occurred only in a moist chamber. Only the *Brachysporium* was isolated from the diseased leaves. Grown on Thaxter's agar it produced a submerged and, after six days, an aerial, dark grey mycelium. Abundant fructification occurred within two weeks at 28° C. The creeping mycelium was at first hyaline, later green or olivaceous; the dark, septate conidiophores were erect or procumbent, simple or sparsely branched, 100 to 400 by 7 to 10 μ wide, proliferating laterally after having produced a conidium. Obovate, 3- to 6-septate, dark brown, opaque conidia with a hyaline outer membrane, and measuring mostly 56 by 26 μ were borne singly terminally.

Under humid conditions, within 24 hours after inoculation with mycelium or spores, definite lesions were produced from which the fungus was reisolated. Control measures are considered to be unnecessary.

Severin (H. H. P.). **Transmission of virus of Pierce's Grapevine disease by spittle insects.**—Abs. in *Phytopathology*, xxxvii, 5, p. 364, 1947.

The following spittle insects have been shown to act as vectors of Pierce's grapevine disease virus [lucerne dwarf virus: *R.A.M.*, xxvi, p. 377]: *Aprophora angulata*, *A. permutata*, *Clastoptera brunnea*, *Philaenus leucophthalmus* and its vars. *leucophthalmus*, *pallidus*, *fabricii*, *marginellus*, *spumarius*, and *impressus*.

Cook (M. T.). **Viruses and virus diseases of plants.**—x+244 pp., 23 figs., Minneapolis Burgess Publishing Company, 1947. $4. [Mimeoprinted.]

This revision of the author's earlier work [*R.A.M.*, xxv, p. 539] brings the development of the subject up to 1946.

N.S.W. Department of Agriculture. Biological Branch-Division of Science Services. Plant disease survey for the twelvemonth period ending 30th June, 1946. Sixteenth Annual Report.—33 pp. [? 1947. Mimeographed.]

This valuable survey of the diseases affecting economic and ornamental crops in New South Wales during 1945–6 [cf. *R.A.M.*, xx, p. 558] has been compiled by officers of the Plant Pathological Section, Biological Branch, New South Wales Department of Agriculture, some of the data on diseases of sugar-cane having been provided by the Colonial Sugar Refining Company, Ltd., and certain information being supplied by the Specialist and Field Officers of the Divisions of Horticulture and Plant Industry. Some of the records have already been noticed from other sources [ibid., xxv, p. 560; xxvi, pp. 74, 123, 330]. New records for the State include *Sclerotium rolfsii* causing rot of Roman hyacinth [*Hyacinthus orientalis* var. *albulus*] and crown rot of *Anemone japonica*, *Gloeosporium* leaf spot of *Adiantum*, *Phytophthora* collar rot of *Daphne* sp. and crown and root rot of honesty [*Lunaria annua*], and [tomato] spotted wilt virus on *Hoya carnosa*. Banana leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: ibid., xxv, p. 99; xxvi, p. 401] was widespread but not unusually destructive. Few growers spray at present. Good control was again obtained at Duranbah by four sprays at monthly intervals.

Chaves Batista (A.). **Principais doenças das plantas, em o nordeste.** [Principal plant diseases in the north-east.]—*Bol. Agric., Pernambuco*, xiv, 1, pp. 5–46, 54 figs., 1947.

The following are among the numerous records comprised in this second instalment of the author's survey of the diseases of cultivated plants in Pernambuco,

Brazil, with recommendations for their control [*R.A.M.*, xxvi, p. 287]. Malvaceae of various kinds, widely cultivated as ornamentals, are very subject to infection by rust (*Puccinia malvacearum*). Orchids of the genera *Laelia* and *Cattleya* suffer from anthracnose (*Colletotrichum* and *Gloeosporium* spp.) [ibid., xxi, p. 202], especially when maintained under insufficiently humid conditions. An undetermined species of *Phytophthora* is responsible for black rot of *Laelia* at Recife [cf. ibid., xxv, p. 502]. *Hemileia oncidii* occurs in a mild form on *Oncidium* spp. A Californian poppy [*Eschscholtzia californica*] wilt of major economic importance is caused by *Sclerotium rolfsii*. Rose diseases include black spot (*Diplocarpon rosae*) and crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*).

Bacterial canker (*P.* [*Xanthomonas*] *vesicatoria*) infects both chilli and tomato, the former also being attacked by *Glomerella cingulata*. Tomatoes are liable to severe infection by anthracnose (*C. phomoides*), *Fusarium* wilt (*F. bulbigenum* var. *lycopersici*), which is also pathogenic to chilli at Recife, and bacterial wilt (*P.* [*X.*] *solanacearum*).

Pathogens of peas include *Ascochyta pisi*, *A. pinodella*, *Mycosphaerella pinodes*, and *C. pisi*. Squash and cucumber are attacked by *Cercospora cucurbitae* [ibid., xxi, p. 47] and the former also by *Puccinia cucumeris*. *Mucuna* spp. are subject to infection by *C. mucunae* [? *C. stizolobii*: ibid., xv, p. 779; xix, p. 692]. *Phytomonas* [*Xanthomonas*] *campestris* is the agent of a destructive black rot of mustard seedlings.

'Pitomba' [*Eugenia luschnathiana*] fruits are commonly affected by scab (*Elsinoe talisiae*) both in Parahyba and Pernambuco. Considerable damage is caused in the date plantations of Bahia and Pernambuco by smut (*Graphiola phoenicis*) [ibid., xvii, p. 504].

South American leaf blight (*Dothidella* [*Melanopsammopsis*] *ulei*) [ibid., xxvi, p. 416] is widespread, especially in Bahia, in young (under ten-year-old) *Hevea* rubber plantings. Sisal anthracnose (*C. agaves*) [ibid., xvii, p. 322] was observed for the first time in Pernambuco.

Downy mildew (*Plasmopara viticola*) and anthracnose (*E. ampelina*) are the most important vine diseases in north-eastern Brazil.

Tai (F. L.). **A preliminary list of economic plant diseases of Yunnan.**—*Bull. Inst. agric. Res., Tsing Hua Univ.*, 6, 36 pp., 1941. [Chinese, with English summary. Received August, 1947.]

This annotated list of diseases affecting economic plants in Yunnan relates to general crops, fruit trees, vegetables, special crops, and ornamentals. Information is given on the distribution and intensity of the several diseases. Many of the 202 pathogens enumerated are stated to be new records for China.

Gordon (Ruth E.) & Smith (N. R.). **Preservation of certain micro-organisms under paraffin oil.**—*J. Bact.*, liii, 5, p. 669, 1947.

Cultures of many kinds of bacteria can be satisfactorily preserved by covering the short agar slants or stabs with sterile paraffin oil to a depth of at least ½ in. About every six months viability is determined by transferring some of the growth under the oil to a fresh tube of a suitable medium.

Taylor (E. Shirley). **The assimilation of amino-acids by bacteria. 3. Concentration of free amino-acids in the internal environment of various bacteria and yeasts.**—*J. gen. Microbiol.*, i, 1, pp. 86–90, 1947.

The results of experiments at the Biochemistry Department, Cambridge, show that there is a definite distinction between Gram-negative and Gram-positive organisms in that 16 of the latter (13 bacteria and three yeasts) were able to

assimilate glutamic acid and lysine into their cells from the external medium and to concentrate these free amino-acids in the internal environment, whereas the cell walls of the 11 Gram-negative bacteria tested did not allow this assimilation.

Goidànich (G.). **Il ritorno della 'malattia dei cereali'.** [The return of the 'cereal disease'.]—Reprinted from *Italia agric.*, *1947*, 1, 7 pp., 5 figs., 1947.

In 1895 and 1896 wheat, barley, and oats in southern and central Sardinia were attacked by a disease causing extremely heavy losses, attributed by Berlese and Saccardo to *Sphaeroderma damnosum* [*R.A.M.*, x, p. 20], the imperfect state of which they considered was *Fusarium culmorum*. This disease recurred in the spring of 1946, when the damage was even more severe. The first symptoms appeared as a yellowing of the apex and later the whole of the leaf blade. Subsequently, the stem rapidly withered. The affected plants soon died, or, more commonly, maintained a sickly growth with almost empty inflorescences.

Isolations from infected material in every instance yielded *F. culmorum*, while *S. damnosum* was also obtained. It seems likely that the latter is parasitic not on the plants but on *F. culmorum*, or that the presence of *F. culmorum* brings about conditions suitable for the development of *S. damnosum*.

F. culmorum lives saprophytically on cereal residues and becomes parasitic at a particular state of susceptibility of the host, due to certain meteorological and soil conditions. The parasitism becomes progressively more marked as the factors which reduce host vitality correspond more closely with those that favour the fungus. The 1946 outbreak was favoured by persistent drought during the previous winter, soil impoverishment due to the lack of fertilizers during the war, and abundant rain with relatively high temperatures in the first fortnight of March. The first symptoms appeared 15 to 20 days after the rain.

In view of the amount of inoculum left on cereal residues after an outbreak, every precaution should be taken to ensure the health of the crops, including burning the stubble, careful preparation of the soil, and seed selection and disinfection.

It is stated in a footnote that other work by the author and A. Mezzetti has since demonstrated that *S. damnosum* and *F. culmorum* are entirely independent organisms, though the growth and multiplication of the former are strongly affected by the presence of the latter (see 'Rapporti tra *Sphaeroderma* e *Fusarium*', *Nuovo G. bot. ital.*, N.S., 1947).

Hurd-Karrer (Annie M.) & Rodenhiser (H. A.). **Structures corresponding to appressoria and substomatal vesicles produced on nutrient-solution agar by cereal rusts.**—*Amer. J. Bot.*, xxxiv, 7, pp. 377–384, 7 figs., 1947.

On agar containing mineral nutrients and glucose (M/5 magnesium sulphate 2·5 c.c.; M/2 ammonium nitrate 0·5 c.c.; M/2 calcium nitrate 1·5 c.c.; M/5 potassium dihydrate 1·5 c.c.; M/5 di-potassium hydrogen phosphate 2·5 c.c.; 0·5 per cent. ferric tartrate 0·5 c.c.; glucose 20 to 60 gm.; distilled water to 1,000 c.c.; agar 20 gm.), uredospores of *Puccinia graminis tritici*, *P. triticina*, *P. dispersa*, *P. coronata*, *P. hordei* (syn. *P. simplex*) [= *P. anomala*], and *P. sorghi* [*P. maydis*] produced primary and secondary vesicles that correspond to appressoria and substomatal vesicles, as they develop in and on the respective host plants. The morphological characteristics of the secondary vesicle, homologous with the substomatal vesicle, differed in each species.

Details of shape, size, and septation of the secondary vesicles and the number of infection hyphae growing from them usually conform closely to the descriptions by Pole Evans (*Ann. Bot., Lond.*, xxi, pp. 441–446, 1907) of the substomatal

vesicle of the respective species as it occurs within the substomatal chamber of the host plant.

The bodies identified as appressoria (primary vesicles) and substomatal (secondary) vesicles on nutrient agar were not formed on water agar. It is thought to be the first report of these structures being formed outside the host. Only occasional hyphae (not more than 1 in 1,000) produced the bodies; they were most common in *P. triticina* and *P. dispersa* and rare in *P. maydis*. The vesicles were produced above the substrate and the infection hyphae grew out into the air from the secondary vesicles to a maximum of 316 μ. None of these hyphae showed any tendency to haustorium formation. The development on agar of a structure corresponding to an appressorium shows that there is a tendency for their formation in the absence of any stimulus from the plant.

Peklo (J.). **Přehled nových poznatků o šlechtění Pšenic proti rzivosti. Šlechtění Pšenic proti žluté rzivosti. Vlastní pokusy a šlechtění.** [Results of recent studies on the breeding for immunity of yellow rust-resistant Wheat varieties. Wheat breeding against yellow rust. Own experiments and breeding.]—*Zem. Arch.*, xxxiii, 9–10, pp. 444–458, 459–522, 7 figs., 1942. [German summary. Received May, 1947.]

Recent experiments by various workers up to the end of 1941 in breeding yellow rust (*Puccinia glumarum*) -resistant wheat varieties are discussed in the first part of this work [*R.A.M.*, xxiv, p. 359; xxv, p. 550]. The points reviewed include the races of the fungus, the factors affecting the disease, and the genetics of resistance. The author refers to the difficulties of growing *P. glumarum* in pure culture and proposes experiments with carotinoids as culture media for this purpose.

The second part deals with the author's experiments in breeding yellow rust-resistant wheat varieties [ibid., xii, p. 360] in Czechoslovakia. In 1930 two resistant types derived from Jinonice × Grenadier II and from Kottengrenadier × Kubanka were crossed and the hybrid was a practically immune and high-yielding type called UP, in which the influence of heterosis was markedly noticeable. From 1936–38 UP was cultivated as winter wheat in the Českomoravská vysočina (about 500 m. above sea-level), where severe yellow rust was expected. The yields of UP in comparison with Dreger, a good-quality winter wheat, were: in 1936, a very severe yellow rust year, 32·55 quintals per ha., 27 per cent. higher than Dreger; in 1937, when there was less rust, 30 q. and 10 per cent.; and in 1938, a year of very severe epidemic, 33·92 q. and 24 per cent., respectively.

Critopoulos (P. D.). **Production of teliospores and uredospores of Puccinia graminis on Berberis cretica in nature.**—*Mycologia*, xxxix, 2, pp. 145–151, 1 fig., 1947.

The alternate host of *Puccinia graminis* in Greece is *Berberis cretica*, the only wild barberry there, and it is attacked annually by *P. graminis*. The author has reported the finding of teleutospores and uredospores of this rust on *B. cretica* [*R.A.M.*, xxvi, p. 188] at high altitudes. They correspond exactly to those ordinarily found on the grass hosts. The brown to black teleutosori, 0·3 mm. in diameter, appear in the middle of July just before the leaves fall and are sparsely produced at the edges of aecidial spots on either side of the leaves. Separate uredosori were not found but uredospores were found among the teleutospores. These states have been reported only once on barberry (*B. vulgaris*) and then by artificial inoculation [ibid., xvii, p. 449]. Spermogonia and aecidia are formed on *B. cretica* as well as teleutospores and a limited number of uredospores. It is postulated that *P. graminis* might be in the process of forming a correlated micro-cylic species with teleutospores on *B. cretica*. From their close proximity it appears

that the teleutospores and uredospores were developed from the same mycelium which bore the aecidia. Teleutospores from the grass hosts in Greece are not viable during long periods of heat or dryness at lower altitudes. Kept under natural conditions there is only 0·5 per cent. germination in the spring. Therefore the production of these spores on *B. cretica* is considered to be the natural adjustment of the fungus to produce the resting spores at high altitudes where their germinating power is more likely to be sustained.

Benlloch (M.). **Contribución al establecimiento de un método para ensayar los desinfectantes contra el 'tizón' del Trigo (Tilletia tritici (Bjerk.) Wint. y T. laevis Kühn).** [Contribution to the establishment of a method for the assay of disinfectants against Wheat 'bunt' (*Tilletia tritici* (Bjerk.) Wint. and *T. laevis* Kühn).]—*Bol. Pat. veg. Ent. agric., Madr.*, xiv, pp. 157–168, 15 figs., 1946.

The usual methods for the assay of disinfectants against wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetida*] having proved ineffectual, the author devised a technique involving (1) tests of spore germinability, (2) *in vitro* experiments on the fungicidal action of the chemical, (3) germination tests on the spores under experimental conditions, (4) the setting-up of an effective control, (5) studies on the action of the disinfectant, and (6) studies on the effects of the disinfectant on the germination and development of the plants.

The best results in the germinability tests were obtained by placing the spores on filter paper over a solution of 1 per mille calcium nitrate in a moist chamber. Thus, spores of *T. foetida* collected from wheat 4½ years after harvesting germinated in a fortnight at the somewhat unfavourable temperature of 22° C., and those from samples harvested a year and eight months earlier germinated profusely in six days. Spores of *T. caries* germinated in five days under the same conditions. In another test *T. foetida* spores of the previous year's harvest germinated in three days in the moist chamber at 17°.

In laboratory assays of toxicity two moist chambers are used, in one of which *T. foetida* spores are laid on filter paper soaked in tap-water, while in the other they are placed on filter paper, impregnated with the disinfectant to be tested. At weekly intervals counts are made of the germinated spores. None had germinated on the chemically treated substratum at the end of three weeks.

For the observation of spore germination under experimental conditions one or two seeds with adhering spores are sown in flower-pots and counts made within the next ten days, special attention being paid to the basidiospores and conidia, from which the infective mycelium arises.

For the routine tests of disinfectants 100 wheat seeds contaminated by *T. foetida* spores were sown in a flower-pot and one removed daily for observation. Germination began on the seventh day and by the tenth both chlamydospores and basidiospores were germinating profusely, the wheat meanwhile passing through the critical stage for infection. When the plants were two months old, eight were selected at random and transplanted: they produced 21 ears, of which 17 (81 per cent.) were entirely diseased. The relative efficiency of different fungicides can be determined by their application to samples of the same seed under identical conditions. In these experiments two commercial preparations were used, one containing an organic mercury salt and the other a copper compound as active principles. In none of the pots, each containing 100 seeds treated with one or other of these chemicals, were germinating spores of *T. foetida* detected up to 17 days after sowing; the 21 ears formed in the mercury and the four in the copper series were all completely healthy. Among the adverse effects induced by excessive or unequal dosages of certain fungicides are atrophy of the root system and stunting or abortion of the seedlings.

Pichler (F.). **Die Bekämpfung des Schneeschimmels (Fusarium) mit chemischen Mitteln im Spätherbst.** [Snow mould (*Fusarium*) control with chemical preparations in the late autumn.]—*PflSch. Ber., Wien*, i, 1–2, pp. 14–26, 1947.

Of the chemicals tested at the Vienna Plant Protection Institute, mostly during the war years, for the control of snow mould (*Fusarium*) [*nivale: Calonectria graminicola*] on the highly susceptible Melker rye variety [*R.A.M.*, xvii, p. 20], the best results were given by the spraying or dusting of the seedlings during November with borax at the rate of 5 gm. per sq. m., 50 per cent. ceresan dust (10 gm.), phenyl mercury pyrocatechol (10 gm.), preparation P (5 or 10 gm.), boric acid (5 gm.), and fusariol and germisan dusts, both at 50 per cent. and 10 gm. per sq. m. It is essential to the elimination of the pathogen that the treatments should be applied in conjunction with appropriate cultural measures [ibid., xii, p. 623].

Littauer (F.) & Gutter (J.). **Sclerotium bataticola Taubenhaus as causal agent of a rot of Shamouti Oranges.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 261–262, 3 figs., 1946. [Hebrew summary.]

Sclerotium bataticola [*Macrophomina phaseoli*] was isolated for the first time from a decaying Shamouti orange found in a grove near Lydda, Palestine. The light brown rot, resembling that due to *Diplodia natalensis*, extended along the segments from the button to the stylar end. The sclerotia produced in culture did not exceed 100 μ in diameter and the fungus would appear, therefore, to fall in Haigh's C group [*R.A.M.*, xii, p. 727]. Fruits of the same variety inoculated with *M. phaseoli* and incubated at 24° C. developed symptoms similar to those obtained by Weindling and Miller in inoculation tests in California (cited by Fawcett in 'Citrus diseases and their control', p. 464, 1936) [ibid., xv, p. 574]. Isolates of the fungus from other sources induced a rotting of Shamouti oranges comparable with that described above.

Asthana (R. P.). **Latent wither-tip infection on Citrus.**—*Proc. Indian Acad. Sci.*, Sect. B, xxiv, 5, pp. 243–245, 1946.

The strain of *Colletotrichum gloeosporioides* isolated on rice meal agar from the pinkish-white areas on the bark of orange trees affected by wither-tip of the trunk and branches in the Central Provinces and Berar corresponds to Chaudhuri's strain A No. 316 [*R.A.M.*, xv, p. 496] and falls approximately within the second group of R. E. D. Baker *et al.* [ibid., xix, p. 663]. Its unicellular, oval conidia, pinkish in the mass, measured 8·46 to 15 by 4·13 to 7 (average 5·5 by 13) μ, and the quadri- to quinquecellular setae were 56 to 133 μ in length. The mycelium survives the adverse atmospheric conditions of the summer months as pink stromata in cortical fissures, and persists as an inter- and intracellular parasite in one or two layers of the bark tissue. Inoculation experiments on the branches of three-year-old orange plants resulted in the development of typical wither-tip symptoms and the reisolation of the fungus from the infected tissues. In agreement with Baker's observations in Trinidad [ibid., xviii, p. 193], the author consistently noted the presence of acervuli on dead wood.

Haas (A. R. C.). **Varietal susceptibility to boron deficiency or excess in Citrus.**—*Proc. Amer. Soc. hort. Sci.*, xlviii, pp. 40–42, 1 fig., 1946.

In experiments under controlled conditions at Riverside, California, in 1945, rough lemon rootstocks proved to be less susceptible than sour orange to boron deficiency and more so to an excess of this element [*R.A.M.*, xxv, p. 447]. The differences are attributed to the more active absorption of boron by the former than by the latter species.

Ramsey (G. B.), Smith (M. A.), & Heiberg (B. C.). **Fungistatic action of diphenyl on Citrus fruit pathogens.**—*Bot. Gaz.*, cv, 1, pp. 74–83, 3 figs., 1944. [Received May, 1947.]

The effect of diphenyl vapour on the growth of ten citrus fruit pathogens cultivated on potato dextrose agar was investigated [*R.A.M.*, xxvi, p. 111]. *Botrytis cinerea*, *Diplodia natalensis*, and *Penicillium italicum* were totally inhibited, and *P. digitatum* to a great extent; *Phomopsis* [*Diaporthe*] *citri* was moderately checked, and *Alternaria citri* and *Colletotrichum gloeosporioides* only slightly so. Apparent recovery from the initial shock of the chemical was exhibited by *Sclerotinia sclerotiorum* and *Trichoderma viride*. Only *Phytophthora citrophthora* showed increased growth in the presence of diphenyl vapour. Spore germination of *A. citri* and *C. gloeosporioides* was apparently unaffected; that of the other species was retarded but not inhibited. On removal of diphenyl the organisms resumed growth and spore production.

Unwrapped oranges placed in cup-like depressions in special paper-pulp trays impregnated with diphenyl developed only 1 per cent. decay when the trays were packed in tight fibre-board boxes for three weeks at 72° F. and 40 per cent. humidity whereas the controls developed 25 per cent. rot.

It is considered that *Penicillium italicum*, *B. cinerea*, *Diplodia natalensis*, *P. digitatum*, and *Diaporthe citri* can be effectively checked by diphenyl vapours but these are not likely to control satisfactorily *A. citri*, *C. gloeosporioides*, *Phytophthora citrophthora*, *S. sclerotiorum*, and *T. viride*.

Scott (Flora M.) & Baker (Katherine C.). **Anatomy of Washington Navel Orange rind in relation to water spot.**—*Bot. Gaz.*, cviii, 4, pp. 459–475, 56 figs., 1947.

The symptoms of water spot in ripening Washington Navel orange [*R.A.M.*, xix, p. 144] are waterlogging and subsequent cracking of the rind. The epidermis is structurally weak and excessive water absorption during winter rains often upsets the critical balance between the epidermal extension and increase in volume of the underlying tissues. The resulting cracks may heal in dry weather by normal cicatrization but in continuous rain may remain open and give entrance to fungal spores. Even after this extensive anatomical investigation of the rind it is still doubtful why the Washington Navel variety should be more susceptible to water spot than other varieties which ripen at the same time, as there are no apparent differences in rind structure. The latter evidently remains unaffected by oil-spraying [cf. ibid., xxi, p. 368], and no anatomical difference is observed between untreated fruits and those which have been oil-sprayed or even oil-dipped.

Moreira (S.). **Observações sôbre a 'tristeza' dos Citrus, ou 'podridão das radicelas'.** [Observations on Citrus 'tristeza' or 'rootlet rot'.]—*Biológico*, viii, 11, pp. 269–272, 1942. [Received July, 1947.]

Reference has already been made to the author's investigations on the 'tristeza' form of citrus root rot in Brazil [*R.A.M.*, xxiii, p. 223; xxvi, p. 298]. The disease is believed to have originated in the Parahyba valley or in the vicinity of Sorocaba, São Paulo, and thence spread to Campinas, Limara, and Piracicaba. It has barely left a trace in Araras and Pintangeiras, where only sporadic cases of infection have been observed in contrast to the entire groves affected in other regions. In the Parahyba valley and Sorocaba dead groves were encountered, whereas in Campinas and Limeira up to 100 per cent. of the plants were diseased but the mortality was low. Superior cultural methods in the latter districts are presumed to account for the difference in the severity of the symptoms. The root rot was found to spread much more rapidly in cold, moisture-retaining soils than in dry, very permeable

ones, in which the disease takes years to reach a climax. Trees of all ages, from nursery plants to upwards of 20 years, are subject to root rot, the former sustaining much heavier damage than the latter under comparable conditions.

The following combinations were found to be susceptible to root rot: sweet on sour orange, Marsh Seedless grapefruit and 'mexiriqueira' tangerine on sour orange, and Galician lemon on sour orange; suspected cases were observed in sweet orange grafted on Persian lime; while Eureka and Sicilian lemons on sour orange, 'pear' orange on rugose lemon, and sweet orange on giant, clove, and 'ceipira' lemons appeared to be free from the trouble. Tangelo (*Citrus nobilis* × *C. paradisi*) scions grafted on sour orange showed differing varietal reactions to root rot, Thornton being very susceptible and Sampson perfectly resistant.

HALE (J. B.). **Mineral composition of leaflets in relation to the chlorosis and bronzing of Oil Palms in West Africa.**—*J. agric. Sci.*, xxxvii, 3, pp. 236–244, 2 graphs, 1947.

Several disorders resulting in foliar chlorosis and necrosis have recently appeared among the oil palms of Nigeria, and in view of the possibility that a mineral deficiency might be concerned in the troubles, samples of diseased material from three estates were submitted to the Rothamsted Experimental Station for analysis.

The first symptoms of the 'lemon frond' disease are the appearance in one of the upper or middle leaf whorls of clear lemon-yellow fronds, which often die as a sequel (according to F. W. Toovey, Senior Botanist, Nigerian Department of Agriculture) to gummosis of the water-conducting vessels of the bundles in the outer periphery of the stem. The disturbance seems to be seasonal, developing as a rule towards the close of the rains. Some cases of grouping of 'lemon frond' have been observed, but many of the affected palms are surrounded by vigorous, healthy ones.

'Bronzing' is the term applied to a condition in which the foliage, usually the middle and lower parts of the crown, is of a bronzed or coppery tinge instead of dark green. The older fronds are most severely attacked and may be bronzed all over, the middle ones are speckled with small, bronze patches, while the upper remain green. A distinct form of this disease, known as 'speckled bronzing', begins with the formation of pale greenish spots scattered over the entire lamina, subsequently turning orange-red and sometimes coalescing to cover a considerable proportion of each leaflet. In the more general type of bronzing the tips and edges of the fronds on the lower leaves acquire an orange-yellow tint and eventually die in much the same way as in the marginal leaf scorch commonly associated with potassium deficiency in many other crops.

'Patch yellowing' starts with moist, brown patches on both surfaces of the unopened leaflet. As the spear opens the patches expand and either turn yellow or shrivel and fall out, imparting a very ragged aspect to the palm.

A disorder originally called 'yellowing disease' [*R.A.M.*, xxii, p. 248] by F. W. Toovey is now believed by the same authority to be similar to, if not identical with, one of the above-mentioned forms of bronzing. The fronds are covered with a mass of small, necrotic spots of varying colour, size, and shape, and ultimately wither and turn grey, becoming so brittle that they break off, leaving the midrib bare.

The bronzing diseases are tentatively attributed, on the basis of chemica analyses, to potassium deficiency, probably combined in one instance with shortage of magnesium. 'Lemon frond' cannot be ascribed to a lack of any of the elements investigated, viz., potassium, calcium, magnesium, and manganese.

The differences in mineral composition of the fronds between palms from the three estates exceed those due to the diseases, and a further survey is planned to determine the range of variation of healthy trees in this respect and the levels below which deficiencies set in.

Ergle (D. R.). **The glycogen content of Phymatotrichum sclerotia.**—*J. Amer. chem. Soc.*, lxix, 8, pp. 2061–2062, 1947.

The glycogen detected in a recent chemical study in the sclerotia of soil cultures of *Phymatotrichum omnivorum*, the agent of cotton root rot, at the Texas Agricultural Experiment Station [*R.A.M.*, xxvi, p. 299], was shown to occur in two forms, viz., (1) free, readily extractable with hot water, and (2) bound, insoluble in hot water but soluble after treatment with hot 35 per cent. potassium hydroxide. Full details are given of the experimental methods used in isolation and purification. The yield of free glycogen from 30 gm. fresh sclerotia amounted to 1·1 gm. or 10·1 per cent. of the dry weight and that of the bound to 2·9 gm. (26·6 per cent.). No differences were found in the chemical properties of glycogen from the two fractions: particulars are given of those of the bound form.

Couch (J. N.) & Dodge (H. R.). **Further observations on Coelomomyces, parasitic on Mosquito larvae.**—*J. Elisha Mitchell sci. Soc.*, lxiii, 1, pp. 69–79, 6 pl., 1947.

In continuation of his studies of *Coelomomyces* [*R.A.M.*, xxiv, p. 504; xxv, p. 560] the senior author has examined large numbers of parasitized mosquito larvae sent to him by H. R. Dodge from Georgia. Several undescribed species of the genus were found and additional information was obtained. Germination of the resting sporangia of *C. dodgei*, *C. punctatus*, and *C. lativittatus*, without preliminary drying, has been observed [ibid., xxiii, p. 16]. The contents of the sporangium swelled, bulging out through the fissure to form a dome-shaped mass. The zoospores were formed after 24 to 36 hours, their structure and method of swimming being typical of the Blastocladiales. Attempts to infect larvae of *Anopheles crucians* with zoospores from resting sporangia of *C. dodgei* were unsuccessful.

According to the observations of Dodge, the ratio of infected larvae to healthy ones is negligible; Muspratt [ibid., xxv, p. 500], however, estimated the mortality of *A. gambiae* due to a species of *Coelomomyces* to be as high as 95 per cent. from 1941 to 1945. Further investigations are required before any conclusion can be drawn as to the possible effectiveness of species of *Coelomomyces* in the biological control of mosquitoes.

Altson (R. A.). **A fungus parasitic on Coptotermes curvignathus, Holmgr.**—*Nature, Lond.*, clx, 4056, p. 120, 1947.

During the course of studies designed to determine the best conditions for maintaining workers of *Coptotermes curvignathus* (the termite pest of *Hevea* rubber) in captivity, an unusually high death rate was observed. An examination disclosed that the insects had been attacked by an Entomophthoraceous fungus which was isolated and cultured without difficulty on standard media and on rice bran. Feeding experiments with the infected rice bran resulted in a 100 per cent. kill of *Coptotermes* workers within 48 hours, the presence of the characteristic hyphae in the tissues of the insects being established.

A relationship seems to exist between this parasite and the species of *Conidiobolus* isolated from *Nasutitermes* by Kevorkian in Cuba [*R.A.M.*, xvi, p. 745]. However, the Imperial Mycological Institute, to which a culture was sent, considers that the Malayan fungus differs slightly from the Cuban one, particularly in its primary conidia which are distinctly larger, and it has not been observed to form villose resting spores. Pending comparison with authentic material, it is regarded provisionally as a new species of *Conidiobolus*.

Flor (H. H.). **Genetics of pathogenicity in Melampsora lini.**—*J. agric. Res.*, lxxiii, 11–12, pp. 335–357, 1946.

The mode of inheritance of pathogenicity in flax rust (*Melampsora lini*) was studied at the North Dakota Agricultural Experiment Station [*R.A.M.*, xxi, p. 80

and next abstract] by determining the reaction of 16 differential flax varieties to F_2 cultures of the pathogen derived from crosses between races 6 and 22 and between 22 and 24. All except Bombay and J.W.S. were susceptible to race 22 (of South American origin). Buda was moderately susceptible to race 24 (North American) and Williston Golden, Williston Brown, and Bombay susceptible, while race 6 (North American) was highly pathogenic only to Williston Golden and Williston Brown. Virulence of *M. lini* in all the differential varieties except the two last-named was inherited as a recessive character. No F_2 culture approximated to parent race 22 in virulence as measured by the number of varieties attacked. From the 133 F_2 cultures of hybrids between races 22 and 24, 64 races were identified, of which only two had been isolated previously, while of the 39 races produced by 98 F_2 cultures from the 6×22 cross only three had been collected before. Bombay was immune from races 6 and 22 and from all the F_2 cultures derived from them.

Segregating ratios and tests for independent assortment of factors indicated that for each pair of factors conditioning rust reaction in the host there is a corresponding pathogenic pair in the parasite. The F_2 cultures of crosses between races 22 and 24 segregated for pathogenicity in Pale Blue Crimped, Kenya, Akmolinsk, Abyssinian, Leona, Ottawa 770 B, Bombay, Newland, and Tammes Pale Blue, varieties having one pair of factors for resistance to the avirulent parent race 24, in a single-factorial ratio; in Bolley Golden and Italia Roma, with two pairs of factors for resistance to the avirulent parent, in a bifactorial; and in Morye, with three pairs of factors for resistance to the avirulent parent, in a trifactorial. Buda was more or less susceptible to both parent races and to all their F_2 progeny while J.W.S. was immune from the four parents and all 231 F_2 cultures.

The χ^2 test of F_2 cultures of hybrids between races 22 and 24 for independent assortment showed the factors for virulence in Pale Blue Crimped, Kenya, Akmolinsk, Abyssinia, and Leona to be so closely linked as to be inherited as a unit. A similar mode of inheritance was established for pathogenicity in Williston Golden and Williston Brown, varieties with a common factor for resistance to certain cultures of this cross. One of the pairs of factors for virulence in Bolley Golden was identical or closely linked with one of those responsible for pathogenicity to Italia Roma. The pair of factors involved in the development of severe infection on Tammes Pale Blue was the same as one of the three pairs of factors concerned in virulence in Morye or closely allied to it.

Analysis for independent assortment of the F_2 cultures from the 22×24 cross showed that 768 races with marked differences in pathogenicity are obtainable theoretically from this cross. There was no indication of allelomorphic or linkage relations between the factors for virulence of race 24 in Bombay and any of those for pathogenicity of race 22 in the 14 differential varieties attacked by it, so that this cross should yield a race capable of infecting all the differential varieties except J.W.S.

It is concluded that the greatest danger to the North American rust-resistant flax varieties lies in the introduction from other regions, particularly South America, of a race which will attack them.

Flor (H. H.). **Inheritance of reaction to rust in Flax.**—*J. agric. Res.*, lxxiv, 9–10, pp. 241–262, 1947.

The interaction of the factors responsible for reaction to rust (*Melampsora lini*) in 20 flax varieties, including the 16 that have served as differentials for the identification of physiologic races of the pathogen [see preceding abstract], was studied by determining the reaction of F_2 populations of crosses between resistant and susceptible varieties. Using selected races of the fungus, it was demonstrated that at least 19 distinct pairs of factors are implicated in conditioning the response to *M. lini* of the 16 differential varieties. Of these 19 pairs, 16 lie in three series or

linkage groups, viz., 7 in the Ottawa 770 B, or *LL*, 4 in the Newland, or *MM*, and 5 in the Bombay, or *NN* series. No crossing-over was observed between factors in either the *LL* or the *MM* linkage groups, and the factors in each of those series are considered to be allelomorphic. Some crossing-over and irregular segregation ratios occurred in hybrids between varieties having factors in the *NN* series, and these are deemed to be linked rather than allelomorphic. Supplementary rust-conditioning factors were found in the four varieties studied in addition to the differentials, namely, Billings, Minn, 25–107, Pale Verbena, and Rio.

The varieties in which single factor-pairs in the *LL* series are responsible for reaction to *M. lini* are Ottawa 770 B, J.W.S., Pale Blue Crimped, and Kenya. One of the two pairs of rust-conditioning factors in Buda, Williston Golden, Bolley Golden, Italia Roma, and C.I. 416–3 lies in the *MM* allelomorphic series. Probably the *MM* factors in Williston Brown and Williston Golden are identical, and those in Bolley Golden and Italia Roma may be so too.

Single pairs of factors in the *NN* linkage group condition the response to rust in Bombay, Akmolinsk, Abyssinian, Leona, and Tammes Pale Blue. The factors in Bombay and Punjab appear to be identical. One of the two pairs of factors concerned in rust development in Italia Roma may lie in the *NN* linkage group.

One pair of rust-conditioning factors in Bolley Golden and two pairs in Morye have not been assigned to any of the three series. Reaction to *M. lini* in Rio is conditioned by three pairs of factors, one apparently lying in each of the allelomorphic series.

A parallelism in linkage was established between some of the factors for rust reaction in the host and those for pathogenicity in *M. lini*. Virulence in Pale Blue Crimped (L^3L^3) and Kenya (L^4L^4) was inherited as a unit, as was also virulence in Akmolinsk (N^1N^1), Abyssinian (N^2N^2), and Leona (N^3N^3). However, pathogenicity of *M. lini* towards these three varieties was also linked with that towards Buda ($L^1L^1M^2M^2$), indicating that association between pathogenic factors transcends the linkage groups conditioning resistance in the host.

Borlaug (N. E.). **Variation and variability of Fusarium lini.**—*Tech. Bull. Minn. agric. Exp. Sta.* 168, 40 pp., 4 figs., 3 graphs, 5 diags., 1945. [Received May, 1947.]

A full account is given of a study of the variability of *Fusarium lini* [*R.A.M.*, xxvi, p. 397] in culture and on the host, the number and distribution of races within the species, the spread and persistence of the fungus in nature, and the environmental factors influencing infection.

The evidence obtained indicated that there are many races of *F. lini* differing physiologically, culturally, and pathogenically. When five flax varieties were inoculated with 13 North American monoconidial isolates of the fungus, it was clearly demonstrated that three definite pathogenic races were present, while minor differences suggested the presence of several others. Isolates 6 and 11, very similar in culture, were quite distinct pathogenically. Linota and N.D.R. No. 114 flax varieties were relatively resistant to isolate 6 and very susceptible to 11. Bison was very susceptible to 6 and resistant to 11. Isolate 1 was distinguished from all the others in that it killed a high percentage of pre-emergent plants of all five test varieties. There was some evidence that this race does not correspond to *F. lini* in all respects. The reaction of a flax variety inoculated with a given race in different experiments was found to be surprisingly consistent.

Eighteen isolates of *F. lini* were obtained from Argentina and several flax varieties inoculated with them. In pathogenicity this group proved distinct from most of the North American races; nearly all the cultures caused wilting in Bison and severe wilt in most of the other North American varieties tested. The North American isolates of *F. lini* that were tested many times in the greenhouse over a

period of two years always retained their identity, this being most apparent with 6 and 11.

Five inoculations were made with eight isolates on the same five test varieties. Again isolates 6 and 11 were very distinct in their differential effects and may be regarded as distinct races. The remaining isolates could not be distinguished as different races under the conditions of the test. Isolate 1, highly pathogenic in greenhouse tests, appeared to be non-pathogenic, probably owing to mutation in the stock culture. Striking antagonism between races 6 and 11 was observed in the field, and confirmed in the greenhouse.

No one flax variety of 20 varieties and lines tested was resistant to every isolate of *F. lini* (5 from South America, 20 from North America) used in the investigation. Most of the varieties and lines were at least moderately susceptible to four of the South American isolates. Bison, generally regarded as the most resistant variety in the United States, showed very slight resistance to any of the South American isolates except 22. South American isolate 24, though generally less virulent than the other South American ones, produced more rapid wilt in Biwing, II–36–p. 4 (C.I. 479 × Bison), II–33–p. 105 (Bison × Newland), and Bolley Golden C.I. 977 than it did in Punjab. All 20 flax varieties tested were susceptible to South American isolate 25. While Koto, Zenith, Bolley Golden C.I. 976, II–33–p. 45, and II–33–p. 58 (the two last-named both progeny of C.I. 697 × Bison) are not classed as resistant, they are resistant to a larger number of races of *F. lini* than some other recently introduced varieties, such as Redwing and Biwing. Some new varieties, e.g., Biwing, apparently resistant in the nursery, were susceptible to several races in the greenhouse.

Inoculations with numerous different forms of the group-species *F. oxysporum* [ibid., xix, p. 495] failed to establish any of them as wilt parasites of flax seedlings. Seventeen crop plants were tested in the greenhouse as possible hosts of *F. lini*, with only negative results.

The evidence indicated that there is a critical period for infection by *F. lini* if the plants are to develop typical wilt. This period is shorter for the more resistant varieties than for susceptible ones. Root wounding appeared to predispose some varieties to infection but not others.

Nobrega (N. R.). **Uma doença de virus em Orquidea.** [A virus disease in the Orchid.]—*Biológico*, xiii, 3, p. 62, 1 pl., 1947. [English abstract.]

The virus responsible for chlorosis, mottling, and whitish flecking of the foliage and stunting in a *Dendrobium nobile* plant at the Biological Institute, Rio de Janeiro, was successfully transmitted by sap inoculations to White Burley tobacco, *Nicotiana rustica*, and *N. glutinosa*. The symptoms developing on these hosts suggest that a strain of *Cucumis* virus 1 [cucumber mosaic virus] is concerned in the etiology of the disease.

Plant diseases. Diseases of Carnations.—*Agric. Gaz. N.S.W.*, lviii, 6, pp. 313–316, 5 figs., 1947.

The four parasitic fungi causing root diseases and crown rot of carnations are *Sclerotium rolfsii* [*R.A.M.*, xvi, p. 368], which attacks during the summer, *Rhizoctonia* [*Corticium*] *solani* [ibid., xxv, p. 344] in the spring and autumn, *Fusarium* sp. [loc. cit.] affecting the crown tissues and roots and causing most damage in early summer, and *Phytophthora* sp. causing a firm brown rot of the crown during the cooler months of the year, but only in wet or badly drained soil. The leaf diseases of carnations which are most serious under humid conditions are rust caused by *Uromyces caryophyllinus* [ibid., xxiii, p. 236] and leaf spot (*Septoria dianthi*) [ibid., xxvi, p. 130]. Carnation mosaic, which affects all commercial varieties grown in the country, is also described. It is probably similar to the

mosaic affecting carnations in the United States [ibid., xxiv, p. 231] but the etiology has not been worked out. Control measures for the root diseases comprise crop hygiene, rotation, and fertilizer treatment, for the leaf diseases spraying with Bordeaux mixture or lime-sulphur and taking cuttings only from healthy plants.

Baker (K. F.). **Heterosporium disease of Nasturtium and its control.**—Abs. in *Phytopathology*, xxxvii, 5, p. 359, 1947.

The extensive nasturtium [*Tropaeolum majus*] seed fields in the coastal districts of California are often severely damaged at midsummer by an undescribed *Heterosporium* leaf spot. The fungus, carried internally in up to 47 per cent. of the seed, infects the stem from the old seed and sporulates profusely after the plant breaks over at soil-level. Foliar infection takes place through hydathodes and insect injuries, and the plants are often leafless by harvest time. In the humid environment beneath the plants the pathogen penetrates pericarps and seeds. Green seed cannot be infected, even through wounds, until the pericarp becomes senescent, when rapid infiltration and sporulation occur. The causal organism persists for at least three years in the seed which, together with volunteer or carry-over plants, constitutes the primary source of infection in the field. Thirty minutes' immersion of the seed in water at 51·7° C., preceded by an hour in cool water, gave excellent control of the leaf spot, with only 3·3 per cent. average reduction in germination. The disease was also eliminated in large-scale trials by the sowing of treated seeds in areas free of infected plants.

Barrett (J. T.) & Hardman (Doris A.). **Myrothecium leaf spot and canker of Gardenia.**—Abs. in *Phytopathology*, xxxvii, 5, p. 360, 1947.

Myrothecium roridum was identified as the agent of a disease of *Gardenia* cuttings in rooting beds under very humid and warm conditions in California, this being the first report of its occurrence in the State. The successful transference of the pathogen to wounded and intact tomato plants and to needle-punctured tomato fruits affords partial confirmation of work previously carried out in England [*R.A.M.*, xxiii, p. 191].

Glenister (P. R.). **Effects of iron deficiency on respiration of Sunflower plants.**—*Bot. Gaz.*, cvi, 1, pp. 33–40, 10 graphs, 1944. [Received May, 1947.]

Sunflowers grown in sand culture with nutrient solution to which no iron salt (ferric citrate) was added developed chlorosis typical of iron deficiency. The respiration rate was depressed in the young leaves which contained only half as much iron as those on normally coloured control plants. No transference of iron occurred from the older leaves, which contained more iron, to the younger ones.

Howard (F. L.). **An organic cadmium fungicide for turf disease.**—*Greenk. Reptr*, xv, 2, p. 10, 1947.

In a comparative trial at the Rhode Island Agricultural Experiment Station in 1945 phenyl amino cadmium dilactate (0·1 lb. in 10 gals. water per 1,000 sq. ft.), zerlate, puraturf, and phygon [*R.A.M.*, xxvi, p. 211] were applied on 26th and 31st July to eight replicate plots of Piper velvet bent [*Agrostis canina*] for the control of copper spot (*Gloeocercospora* [*Ramulispora*] *sorghi*) [ibid., xxv, p. 397]. Fifty-eight days later the average infection on the plots treated with cadmium was only 0·8 per cent., compared with 6·2, 14·8, 34·3, and 24·3, respectively, on those sprayed with puraturf, zerlate, and phygon, and the controls.

In 1946 the cadmium compound was further tested with 23 other fungicides against dollar spot (*Sclerotinia homoeocarpa*) on *A. canina* and the Colonial, C 19, and C 15 varieties of creeping bent [*A. stolonifera*]. The first application was made on 4th to 5th June, before the disease was observed, and further treatments were

given at ten-day intervals. By 31st August, just after the ninth application, the cadmium-treated C 15 creeping bent plots were still free from infection, while 16 of the other fungicides permitted the development of 20 to 69 per cent. So severe was the disease (over 40 per cent. of the grass killed) on plots treated with ten experimental preparations that the cadmium complex was substituted in the last four applications, resulting in a reduction in the area of damaged grass to 10·4 per cent.

To test its curative properties phenyl amino cadmium dilactate was applied on 27th July, 1946, to the centre 10-ft. strip of 20 by 20 ft. plot of seaside bent [*A. alba*], about 7 per cent. of which was seriously injured by dollar spot. 2 gals. water containing 1 in 5,000 of the toxicant being used. A second treatment was given ten days later, by which time the spots had filled in so that the symptoms were barely perceptible. After another three weeks the treated turf was entirely free of infection.

Allison (J. L.) & Chamberlain (D. W.). **Distinguishing characteristics of some forage-grass diseases prevalent in the North Central States.**—*Circ. U.S. Dep. Agric.* 747, 16 pp., 16 figs., 1946.

This circular, illustrated with excellent photographs, brings together the available information regarding the more important diseases of pasture and forage crops in the north-central region of the United States, special emphasis being placed on the distinguishing characteristics of each disease. Of the diseases attacking perennial grasses, powdery mildew (*Erysiphe graminis*) and leaf rust (*Puccinia poae-sudeticae*) are common on Kentucky bluegrass (*Poa pratensis*) [*R.A.M.*, xxiv, p. 317]. The latter first appears in late spring as small, chlorotic spots developing into typical rust pustules, and is seasonal in its development, which is favoured by warm, humid weather. Stem [black] rust (*Puccinia graminis*) attacks cereal crops and several grasses, including Kentucky bluegrass. Stripe smut (*Ustilago striiformis*) [loc. cit.] is also common on Kentucky bluegrass. Another stripe smut (*Urocystis agropyri*) [ibid., xxiii, p. 57], which is less common on Kentucky bluegrass, can only be distinguished from the first by the spores which are formed in balls with one to three fertile spores surrounded by a single layer of empty cells. Leaf spot (*Helminthosporium vagans*) [ibid., xxiv, p. 317] attacks only Kentucky bluegrass and occurs from late spring until autumn, attaining its greatest severity during midsummer, especially in hot, humid weather. Bacterial blight (*Pseudomonas coronafaciens* var. *atropurpurea*) [ibid., xxiv, p. 144] seriously attacks smooth brome grass (*Bromus inermis*) as well as several other grasses. The initial water-soaked areas turn purplish-black and often coalesce to cover the entire blade and sheath. As the blighted leaves wither and die, the lesions fade to a rusty brown. This disease is most destructive in mid-June and is favoured in its development by periods of hot, humid weather. Leaf spot (*Selenophoma bromigena*) [ibid., xxiv, p. 316] and brown spot (*Pyrenophora bromi*) [ibid., xxiv, p. 317] appear on smooth brome grass in early spring. Both scald (*Rhynchosporium secalis*) and ergot (*Claviceps purpurea*) are common on smooth brome grass and are favoured by periods of warm, moist weather. Brown stripe (*Scolecotrichum graminis*) [ibid., xxii, p. 435] attacks many grasses throughout the growing season. After browning, the leaf blades wither and die, dense, black conidiophores appearing between the leaf veins, the conidia being readily disseminated by wind and rain. Net blotch (*H. dictyoides*) [ibid., xiv, p. 515] attacks only meadow fescue (*Festuca elatior*), and occurs from late spring to autumn, attaining its greatest severity during midsummer. It is favoured by periods of hot, humid weather. The irregular, brownish lesions are marked with a delicate, netted pattern before the leaf eventually withers and dies. The conidia borne on the lesions or withered leaf tips are subhyaline to yellow, typically straight and three- to five-septate.

Of the diseases of annual grasses, all of which are favoured by warm, moist weather, bacterial spot (*Pseudomonas syringae*) [ibid., xxv, p. 41] attacks several grasses and is common on Sudan grass (*Sorghum*) [*sudanense*]. The initial water-soaked areas soon become dry, pale, and papery. The disease appears soon after seedling emergence and progresses throughout the growing period until all the leaves are affected. Bacterial stripe (*P. andropogoni*) is also common on Sudan grass and to a lesser degree on other grasses. The initial long, narrow, irregular leaf stripes soon dry and are covered with a dry exudate, the leaves more seriously affected becoming withered. The disease appears about midsummer and continues until plant maturity. Leaf blight (*H. turcicum*) [ibid., vi, p. 547] attacks maize and sorghum seriously in some areas of the United States and is destructive on Sudan grass [ibid., xxii, p. 383] in the north-central region. The foliage typically appears blighted or scalded, the symptoms appearing over a whole field within a few days. Conidia are produced in abundance on the lesions. The blight appears about midsummer and continues until plant maturity. Anthracnose (*Colletotrichum graminicola*) [ibid., xix, p. 602] attacks several grasses and is common on Sudan grass. Initial symptoms appear on the basal leaves as small, necrotic eye spots, each containing a visible black body. These are filled with conidia and, being open, are readily subject to secondary infection. The disease may eventually affect all the leaves which wither and die after individual lesions have coalesced. Anthracnose appears about midsummer and develops rapidly until plant maturity. An illustration is given of non-parasitic foliage disorders to which Sudan grass is especially prone. There is also a short review in general terms of the control measures for the diseases.

Rogers (H. T.). **Iron deficiency of Crimson Clover on a calcareous soil and method of diagnosis.**—*J. Amer. Soc. Agron.*, xxxix, 7, pp. 638–639, 2 figs., 1947.

Crimson clover (*Trifolium incarnatum*) was sown as a winter legume for grazing on calcareous Houston clay at the Black Belt Substation, Marion, Alabama, in the autumn of 1945, a 0–14–10 fertilizer being applied at the rate of 400 lb. per acre. The stand soon developed acute chlorosis. In order to diagnose the deficiency, specimens of the clover and soil were treated in the greenhouse with various combinations of nitrogen, boron, copper, iron, magnesium, manganese, and molybdenum. The only successful treatment consisted of a 0·1 per cent. ferrous sulphate spray, applied to the plants every three to four days. The compound failed to correct the iron deficiency symptoms when used as a soil amendment, indicating precipitation of the element in an unavailable form. Ammonium nitrate sprays intensified the chlorosis and retarded the maturity of the plants.

Wilsie (C. P.) & Hughes (H. D.). **Development of early maturing wilt-resistant strains of Korean Lespedeza.**—*J. Amer. Soc. Agron.*, xxxix, 7, pp. 615–622, 1 fig., 1947.

In 1942, replicated trials were instituted at the Iowa Agricultural Experiment Station to determine the reaction to wilt (*Phytomonas lespedezae*) [*R.A.M.*, xix, p. 543], relative maturity, and forage and seed yields of a number of promising selections of *Lespedeza stipulacea*. By 1944 three strains with satisfactory records in respect of disease resistance and early maturity were deemed to be ready for increase and distribution under the designations of Iowa 6, Iowa 39, and Iowa 48. The wilt-resistance indices (five-year average of field observations) for these three strains, in a scale of ascending susceptibility from 1 to 9, were 2·1, 2, and 2·5, respectively, as against 4·2 and 7·1 for Iowa 81 and Early Korean 19604, respectively. Some 5,000 lb. seed of Iowa 6 was available by the autumn of 1946, and it is being intensively propagated in the southern counties of the State to ensure plentiful supplies for 1948. A beginning has also been made with the increase of 39 and 48.

Wilson (M. C.). **Inheritance of resistance in Alfalfa to bacterial wilt.**—*J. Amer. Soc. Agron.*, xxxix, 7, pp. 570–583, 1 fig., 3 graphs, 1947.

Data are presented from the writer's studies in California demonstrating that the resistance of lucerne to bacterial wilt (*Corynebacterium insidiosum*) [*R.A.M.*, xxvi, p. 398] can be resolved into terms of separate genes. Three or possibly four partially dominant genes for different degrees of resistance were segregated, of which one, P, appears to confer sufficient protection against the disease to be of value in the breeding of resistant plants. Homozygous P produced 72 per cent. healthy, 20 per cent. intermediate, and 8 per cent. severely infected plants, the corresponding figures for the susceptible California Common variety being 2, 7, and 91 per cent., respectively. Clones from individual plants showed that a single genotype might vary from healthy to severely diseased even under fairly uniform conditions. The inoculation of clones consisting of five to ten plants is a promising method of identifying self-sterile F_2 or back-cross plants as resistant or susceptible.

Bremer (H.). **Beobachtungen an Holzpflanzen im Steppenklima von Ankara.** [Observations on woody plants in the steppe climate of Ankara.]—*Rev. Fac. Sci. Univ. Istanbul*, Sér. B, xii, 1, pp. 9–34, 1 pl., 1947. [Turkish summary.]

Fruit-growers in the Ankara district of Turkey, relying overmuch on the recognized resistance of apricots to drought, tend to neglect essential cultural precautions in the orchard, with the result that die-back or 'apoplexy' is prevalent [cf. *R.A.M.*, xiv, p. 215]. Another trouble incidental to the 'steppe' climate is chlorosis, which is particularly severe on *Robinia pseud-acacia*, *Acer negundo*, *Catalpa bignonioides*, poplar (*Populus nigra*), and roses, while other susceptible species include *Thuja orientalis*, *Salix alba*, pear, apple, quince, peach, and plum. They are mostly ill adapted to the local environment by reason of their small, scattered stomata, retarding the transpiration of water. Other adverse factors besides the inadequate water supply are the predominantly alkaline soils and exposure to sunlight of excessive intensity.

Atkinson (J. D.). **A note on crinkle in New Zealand Apples.**—*N.Z. J. Sci. Tech.*, A, xxviii, 5, pp. 332–334, 1 fig., 1947.

Crinkle, a physiological disorder of apples, appeared for the first time in New Zealand during the 1945–6 season [cf. *R.A.M.*, xiv, p. 592]. It is characterized by external depressions, generally at the calyx end, with an underlying area of light brown, necrotic tissue, of spongy texture and split up by numerous cavities, seldom extending more than 10 mm. into the flesh. The disease was reported from Auckland, Hawke's Bay, and Nelson, affecting the Winesap, Rome Beauty, and Sturmer varieties, respectively.

McAlpine regarded crinkle as a 'confluent form' of bitter pit (Bitter pit investigations: first progress report, 1912). Carne and Martin, studying the condition in the southern half of Australia and Tasmania [*R.A.M.*, xiv, p. 242], claimed that water core was an essential phase in its development and that high temperatures were the primary cause. In New Zealand, too, high temperatures, coupled with drought, appear to be a decisive factor in the etiology of crinkle. Fisher *et al.* in the United States [ibid., xi, p. 55] and Ware in England (*Gdnrs' Chron.*, xcii, pp. 287–288, 1932) also observed the favouring influence of heat on the disease.

Compton (O. C.), Granville (W. C.), Boynton (D.), & Phillips (E. S.). **Color standards for McIntosh Apple leaves.**—*Bull. Cornell agric. Exp. Sta.* 824, 824A, 15 pp., 5 graphs, 2 col. charts, 1946.

The seven colour standards presented in this bulletin have been developed for measuring the nitrogen content of McIntosh apple leaves during July, the month

when the nitrogen content is changing the least. One leaf is picked from the median part of each of 10 to 12 shoots which are distributed uniformly around the outside of the tree, and are compared with the colour standards for each of which a corresponding nitrogen percentage on a dry weight basis is given. Values below 2·1 per cent. in July indicate nitrogen deficiency.

Pieniazek (S. A.), Christopher (E. P.), & McElroy (L. A.). **Further data on the control of storage scald of Apples by means of carbon dioxide.**—*Proc. Amer. Soc. hort. Sci.*, xlviii, pp. 81–88, 1946.

At the Rhode Island Agricultural Experiment Station in 1945–6, storage scald of apples was controlled by a few days' exposure of freshly harvested fruit to high concentrations of carbon dioxide at 32° F. [*R.A.M.*, xxv, pp. 1, 121], the most satisfactory results being obtained by a five-day treatment at 50 per cent. The delayed ripening of the fruit consequent on the application of carbon dioxide would prolong the storage period.

Baldwin and McIntosh apples maintained under the conditions described developed corky pockets of brown tissue near the core, but no adverse effects were observed on Cortland, Rhode Island Greening, Northern Spy, Stark, Delicious, Gravenstein, Winter Banana, Wealthy, or Jonathan. The general use of carbon dioxide cannot, however, be recommended until safe limits of effective concentrations can be defined and better methods of gas dispersal developed.

Promising results were also obtained with Bartlett pears.

Whittaker (E. C.). **The common storage of Granny Smith Apples.**—*Agric. Gaz. N.S.W.*, lviii, 6, pp. 303, 312, 1947.

Experiments carried out at Batlow and Orange, New South Wales, during the past few years have proved that Granny Smith apples [*R.A.M.*, xxvi, p. 229] can be held at ordinary cool storage temperature either unwrapped or plain wrapped until early July without any superficial scald [loc. cit.] developing. These trials also showed that fruit could be held until early August with hardly any expectation of scald development. Fruit so treated and removed from store in August, wrapped in oiled wraps, and returned to store until December showed only light superficial scald, even though the fruit was held at atmospheric temperature for a fortnight. It is suggested that if after about two weeks in common storage Granny Smiths be placed in cool store, unwrapped and unpacked and held until July before grading, sizing, and oil-wrapping prior to returning to cool store, many complaints of excessive wastage due to over-maturity disorders in late-marketed apples would be avoided.

Sinha (S.). **On decay of certain fruits in storage.**—*Proc. Indian Acad. Sci.*, Sect. B, xxiv, 4, pp. 198–205, 1946.

This is an amplified account of the writer's studies at Lucknow on the fungal spoilage of mango, apple, orange, and other fruits, a note on which has already appeared [*R.A.M.*, xxiii, p. 347].

Fikry (A.). **Water-table effects. V. Peach functional disorder.**—*Bull. Minist. Agric., Egypt*, 245, 42 pp., 19 pl., 1 graph, 1947.

The writer has already shown [*R.A.M.*, xvi, p. 755] that stone fruit trees in Egypt are adversely affected by the high subsoil water-table. In the present paper a comprehensive, tabulated account is given of studies carried out from 1935 to 1938 on the relation of this factor to a functional disorder stated to be the main pathological problem of the peach tree in the country. It induces a generally unthrifty condition, progressive debility, substantial yield reductions, and culminates in the death of the trees. The losses from this source amount annually to

thousands of pounds, and the large-scale eradication of the diseased stands has necessitated the importation of large quantities of peaches to augment the inadequate home-grown crop. The area devoted to peach-growing has diminished considerably owing to this disorder.

Chemical analyses of the soil and subsoil water revealed no toxic substances that might be responsible for the ill health of the trees. In years of normal floods *Prunus davidiana* shows a fair degree of resistance to the functional disorder, especially in comparison with the highly susceptible Baladi. There was no significant difference between the six scions used in the tests in respect of their reaction to the disease. Trees grown in the lower terraces were more subject to infection by rust [*Puccinia pruni-spinosae*] and shot hole [*Clasterosporium carpophilum*] than those situated on the higher levels, the incidence of infection on all scion varieties being essentially identical. The attacks increased in direct correlation with the rise of the subsoil water-table during the inundation period. The yield was considerably reduced in the low lands. Suggestions for the control of the trouble include the laying down of drains not less than 1 m. in depth; the maintenance of a low water-table not more than 1 m. below soil surface during the Nile flood in normal years; the use of resistant (*Prunus davidiana*) rootstocks; and a general survey of contour heights of localities above sea-level to determine suitable sites for peach-growing.

Carlson (R. F.). **Treatment of Peach seed with fungicides for increased germination and improved stand of Peach seedlings in the nursery.**—*Proc. Amer. Soc. hort. Sci.*, xlviii, pp. 105–113, 1 fig., 1946.

Of the six commercial fungicides applied to peach seed and whole pits of the Lovell, 'Natural', and Salwey varieties, either as dusts or solutions (20 hours' soaking or 30 minutes' immersion under partial vacuum) at the New York Agricultural Experiment Station, fermate and spergon (1 to 3 lb. per 100 gals.) were the most effective from the standpoint of increased germination, freedom from [unspecified] fungal contamination, and improvement in stand. Arasan, ceresan, semesan, and zerlate gave moderately satisfactory results. In one test the average germination of treated and untreated Lovell seed was 43 and 18 per cent., respectively, and of Salwey 86 and 43 per cent., respectively. The treatment of partially germinated seed resulted in a decreased stand as compared with dormant. Treatment of the pits with aqueous solutions under partial vacuum was less successful than soaking in these experiments.

Rangel (J. F.). **A calda bordaleza afeta as plantas?** [Does Bordeaux mixture affect plants?]—*Bol. fitossan. Minist. Agric., Rio de J.*, ii, 1, pp. 9–16; 2, pp. 115–127, 1945. [Received August, 1947.]

Many of the 74 papers comprised in the author's survey and discussion of the available information on the beneficial and detrimental effects of Bordeaux mixture on plants have already been noticed in this *Review*.

Test tube dilution technique for use with the slide-germination method of evaluating protective fungicides.—*Phytopathology*, xxxvii, 5, pp. 354–356, 1947.

Full directions are given for the application of the test-tube dilution technique, an elaboration of one previously developed [*R.A.M.*, xx, p. 543], in conjunction with the standard slide-germination method of the committee on standardization of fungicidal tests of the American Phytopathological Society [ibid., xxii, p. 489].

The method is eminently suitable for preliminary tests of new fungicides. Omitting refinements the procedure is essentially as follows: solutions of the chemical to be tested are prepared in concentrations of 10,000, 1,000, 100, 10, and 1 p.p.m. and further diluted in the manner prescribed. To a spore suspension of the test fungus at a concentration of 500,000 spores per ml. an equal volume of spore

stimulant solution (e.g., orange juice or potassium citrate plus sucrose, which insure a high and relatively stable germination percentage in the controls) is added at a concentration ten times that finally desired. Samples of the mixture, each 0·5 ml., are then pipetted into each test tube containing 2 ml. of the chemical undergoing test. Two drops from each test tube of spores and chemical are pipetted on to the left-hand side of a glass slide in a moist chamber, the right-hand side being reserved for tests with a second fungus. Germination counts are made 20 to 24 hours later.

Standardized spray nomenclature. The American Phytopathological Society Committee on Standardization of Fungicidal Tests.—*Phytopathology*, xxxvii, 5, pp. 357–358, 1947.

With the co-operation of plant pathologists, entomologists, and horticulturists in the various pertinent regions of the United States, a scheme of standardized spray nomenclature has been drawn up, and is here presented, in which the terms employed are believed to express the best general and current usage. They relate to dosage, with examples of some standard liquid mixtures and dusts, and to the times of treatment of (1) apples and pears, (2) peach, plum, apricot, and almond, (3) cherry, and (4) quince, each term being accompanied by a definition.

Weaver (W. E.) & Whaley (W. M.). **Organic fungicides. I. The preparation of some α-bromoacetamides.**—*J. Amer. chem. Soc.*, lxix, 3, pp. 515–516, 1947.

Twenty-three α-bromoacetamides, of which 20 are new compounds, have been prepared at the Naval Research Laboratory, Washington, D.C., preliminary to appraisal of their fungicidal activity. A general method for the preparation of amides from acid halides in ethylene dichloride is given.

Virgin (W. J.) & Maloit (Jean C.). **The use of triethylene glycol vapor as an aid in the control of air-borne contaminants.**—Abs. in *Phytopathology*, xxxvii, 5, p. 365, 1947.

Triethylene glycol vapour is stated to have proved very efficient in the elimination of air-borne contaminants in a pathological laboratory without adverse effects on the worker. A beaker containing 100 c.c. of the compound placed on a low Bunsen burner flame will fumigate a room of 7,000 cu. ft. in about 20 minutes, using 40 to 50 c.c. liquid. The vapour rises to the ceiling and gradually settles down to the floor, carrying with it most of the organisms floating in the air. Five minutes' exposure of agar plates before and after fumigation showed a considerable reduction in the number of atmospheric contaminants in the latter series.

Westerdijk (Johanna). **On the cultivation of fungi in pure culture.**—*Antonie van Leeuwenhoek J. Microbiol. Serol.*, xii (*Jubilee Volume Albert J. Kluyver*), pp. 223–231, 1947.

The history of fungal and bacterial culture is briefly reviewed, followed by a summary of 40 years' experience of culturing fungi (yeasts excluded) at the Centraalbureau voor Schimmelcultures, Baarn. Results have shown that widely different media should be used in succession for any one species, rich media alternating with poor ones, dry with moist, and complex with simpler ones. Carbohydrate concentration is generally too high. The author prefers media containing 2 to 3 per cent. sugar which restricts autolysis and acid formation. A pH range between 3·5 and 7 has less influence on most fungi than might be expected. In general, a neutral reaction is advisable and the view that most fungi are acidophilous is incorrect; even plant parasites, such as *Nectria* spp., may prefer extracts with pH 7·5. Actinomycetes prefer an alkaline medium.

Synthetic solutions are unsuitable for continuous cultivations. Juices from cherries, plums, tomatoes, and other fruits are preferable and primarily suitable

for preliminary isolations, as they have a low pH (3 to 4), which generally prevents the development of bacteria. Cherry juice is the best; most of the wood parasites thrive on it, as well as the organisms causing leaf spots and different forms of anthracnose (*Septoria*, *Cercospora*, *Phoma*, and *Ascochyta* spp.), which prefer media of low concentration to which no sugar should be added.

In some cases glycerol is a good source of carbon, e.g., for parasitic Actinomycetes, being added to starch-containing media, e.g., potato plugs. Virulent plant parasites, such as *Venturia* and *Claviceps* spp., thrive better on asparagine as a nitrogen source than on nitrates or ammonia compounds.

Change of temperature gives good results, e.g., change from higher to lower temperatures may induce fruiting in the Basidiomycetes. A moderately low room temperature is best generally, but sometimes higher temperatures are advisable, for dermatophytes, thermophilous fungi, *Aspergillus* spp., and Actinomycetes. *Penicillium* [*Carpenteles*] perithecia also often develop at these levels.

A minimum humidity of 7 per cent. is necessary. Neon light sometimes favours spore production. It is certain that each medium and all the environmental factors act in a definite way on each organism. Oval spores may become almost circular in agar, while others may decrease in size; walls may swell.

When possible, transfers should be made from sporulating mycelium, since fluffy aerial mycelium generally produces only sterile growth. In some instances (e.g., Basidiomycetes) large pieces of medium should be transferred with the fungus, because spores of many species do not germinate easily and the hyphae are sensitive to the high temperature of the needle. Some species require to be transferred every two months, especially those that thrive on readily drying media. Oomycetes should be transferred monthly and the Chytridiaceae more often.

Skerman (V. B. D.). **Simple techniques for the preparation of mould mounts.**—*Aust. J. exp. Biol. med. Sci.*, xxiv, 4, pp. 319–320, 3 figs., 1946.

The organism should be grown on Czapek-Dox agar, and a drop of a mixture of 75 parts ether and 25 alcohol discharged over the area from which the preparation is to be taken. After partial evaporation a drop of a solution of 75 ml. ether, 25 ml. ethyl alcohol, and 10 gm. celloidin should be placed with a 4-mm. loop within the moistened area. The celloidin will dry in one to three minutes as a thin film in which the mycelium is embedded. When sufficiently firm the film may be transferred to a slide with a pair of forceps.

The film should be taken from an area where the mycelium is not too dense. Pre-treatment with the ether-alcohol mixture prevents the inclusion of air bubbles in the celloidin. The film should be transferred to a clean slide and mounted under a cover-slip in lactophenol blue. After a few minutes the preparation may be examined without further treatment, or the film may be washed and mounted in clear lactophenol. Where the mycelium is too dense for this method, it should be teased out prior to staining after dissolution of the celloidin with the ether-alcohol mixture, preferably on a hot plate with a surface temperature of 45° to 50° C.

Preparations suitable for photographic purposes may be obtained by ten minutes' immersion of the film in lactophenol blue, washing with water, immersion in warm (45°) alcohol until the stain no longer runs freely, transference to a clean slide, removal of the celloidin with the ether-alcohol solvent, teasing, and mounting in clear lactophenol.

Proceedings of the Society for General Microbiology.—*J. gen. Microbiol.*, i, 1, pp. i–vii, 1947.

At the Society's fourth general meeting in December, 1946, papers on the virulence of bacteria, fungi, and viruses in plants, protozoa, and the higher animals were the subject of a symposium entitled 'The nature of virulence'.

In a paper on virulence of bacteria in plants [*R.A.M.*, xxvi, p. 288] Mrs. Dagny Oxford points out that bacterial plant pathogens are confined to the two genera *Bacterium* and *Pseudomonas*, which are free-living, heterotrophic, gram-negative, non-sporing micro-organisms, and this fact indicates that the plant host is much more efficient than the animal in withstanding bacterial infection. Plant tissues are invaded by bacteria chiefly through wounds, insect bites, or abrasions, humidity being the most important environmental factor. Ability to invade is only one aspect of virulence; communicability, the power of becoming established in the host under natural conditions, requires more attention. A study of the pectolytic enzymes might throw light on the action of the bacteria which break down tissues and cause necroses, wilts, and cankers. Protective use might be made of the fact that many pathogenic pseudomonads produce a levan from sucrose. Wormald [ibid., xiii, p. 710] has contributed much information on the host range of these pathogens and information from the various lines of approach should be collated.

J. T. Duncan, in his paper on the virulence of fungi in animals [ibid., xxii, p. 306], concludes that, interpreted in the restricted sense of infectivity and invasive power, virulence seems to be largely a matter of morphological and physiological adaptability to parasitic life in animal tissues.

K. M. Smith, in his paper on the virulence of viruses in plants, attempts to define virulence and discusses whether it is ever an intrinsic property of a virus or merely a host-parasite relationship, quoting examples of various viruses and their host relationships.

[The summary of E. Gäumann's contribution on the virulence of fungi in plants is not included.]

Rennerfelt (E.). **Några undersökningar över luftens halt av svampsporer.** [Some investigations on the fungus spore content of the air.]—*Svensk bot. Tidskr.*, xli, 2, pp. 283–294, 3 graphs, 1947. [English summary.]

In 1946 the fungus spore content of the outdoor air at the Experiment Station near Stockholm was investigated. The spores were trapped in 9-cm. Petri dishes exposed fortnightly for one to two hours in the winter months and for 15 to 30 minutes during the remainder of the year. Of the 1,572 colonies thus obtained, principally from July to September, 810 (51·5 per cent.) were blueing fungi, 313 (19·9 per cent.) moulds, and 449 (28·6 per cent.) yeasts. *Cladosporium herbarum* was the most frequent of the blue-staining organisms and constituted 33·1 per cent. of the total number of fungi isolated; it was followed by *Pullularia pullulans*, [*R.A.M.*, xxvi, p. 368], *C. effusum* (the agent of pecan scab in the United States) [ibid., viii, p. 114 *et passim*], *Alternaria* spp., *Phoma* spp., and miscellaneous, representing 4·1, 2·8, 0·5, and 0·6 per cent., respectively, of the total. *Penicillium* spp. were the predominant moulds (7·4 per cent. of all the fungi isolated), *Aspergillus* spp. (mostly *A. niger*) being less prevalent (2·4 per cent.), while *Mucor*, *Cephalosporium*, *Trichoderma*, *Trichothecium*, and other species were rarely detected. *Torulopsis* and *Rhodotorula* spp. were the most common yeasts, representing 18·6 and 6·8 per cent., respectively, of the total number of isolates.

Björkman's analyses of the fungus spore content of the air in a saw-mill timber yard, summarized in the present paper, have already been reported [ibid., xxvi, p. 322].

Counts of the spores in the air of a room at the Forest Research Institute, made concurrently with the outdoor experiments, revealed a much lower content. *P.* spp. were the most abundant (200 out of 540 colonies or 37 per cent.), followed by *Cladosporium herbarum* (122 or 22·6), while other species present included *Torulopsis* (37 or 6·8) and *Pullularia pullulans* (34 or 6·3).

Areas vulnerable to mildew attack.—*Amer. Dyest. Reptr*, xxxvi, 5, p. 129, 1 map, 1947.

Mildew and rot, generally assumed to be a problem only in the semi-tropical southern States of the American Union, actually attack textiles, paper, &c. [see next abstracts] throughout the country, the cost to the public of the damage thus sustained being conservatively estimated at over $100,000,000 per annum. The accompanying map, prepared by Givaudan-Delawanne, Inc., a chemical firm actively engaged on mildew and mildew-proofing research, shows the areas vulnerable to mould infection during an average July.

Humidity is the key factor in the development of fungal spoilage, which may occur at a temperature as low as 45° F. provided humidity ranges from 75 per cent. upwards. Vertical lines on the map mark areas where the humidity exceeds 80 per cent. (dangerous), dots denote a range of 60 to 80 per cent. (vulnerable), and white sections indicate relative safety associated with less than 60 per cent. humidity. Critical areas in the south where high humidity combines with temperatures above 80° are shown by means of horizontal lines.

Dean (J. D.) & Worner (R. K.). **The degradation of untreated Cotton fabrics exposed to weather in a subtropical climate.**—*Amer. Dyest. Reptr*, xxxvi, 15, pp. 405–410, 423–424, 2 figs., 5 graphs, 1947.

Changes in breaking strength and fluidity were the chief criteria applied in the assessment of degradation suffered by cotton fabrics in a series of tests from 1942 to 1946 involving exposure to the weather in the subtropical climate of New Orleans [cf. preceding and next abstracts]. The grey samples were found to be much more severely attacked by mildew, with consequent loss of breaking strength, than the kierboiled or bleached, without any significant increase in the fluidity values. To confirm this effect of purely biological degradation, samples of grey and bleached print cloths were inoculated with pure cultures of the cellulose-destroying fungus, *Metarrhizium glutinosum* [*Myrothecium verrucaria*: *R.A.M.*, xxvi, p. 474], and incubated until they had lost some 90 per cent. of their original breaking strength. In a parallel test grey osnaburg was buried in biologically active soil for six days, by which time it had undergone a breaking-strength loss of 93 per cent. No appreciable fluidity increase was observed in any of these extensively degraded samples.

In another experiment, designed to ascertain the effect of seasonally influenced biological action on the strength and fluidity of weathered cotton, three replicate samples each of grey and bleached sheeting were exposed from January to March and identical sets from June to August, these two periods representing the minimum and maximum, respectively, of biological activity. After the three months of winter exposure both the grey and bleached samples had lost about 20 per cent. of their initial strength; there was, however, a larger increase of fluidity (from 3 to 16 rhes) in the latter than in the former (2 to 10). At this time the grey cloth showed slight but unmistakable symptoms of mildew in the form of scattered discolorations of pinhead size on the lower surface, whereas the bleached samples were free from visible infection. As a result of the summer exposure strength losses rose to 41 and 52 per cent., respectively, in the bleached and grey samples, the latter being heavily spotted with mildew while the former showed only a slight discoloration, chiefly from the growth of a greenish alga-like organism.

The different types of degradation affecting the grey and bleached samples exposed during these two seasons were in general agreement with the results obtained in the multiple-exposure sets of grey duck and osnaburg and grey twill. After three months of exposure made with starting dates between November and January, six samples of duck and osnaburg (considered as one fabric) showed an average strength loss of 12·5 per cent. and an average fluidity of 10 rhes, the

corresponding figures for eight similar samples exposed for three months starting between May and August being 35 per cent. and 9 rhes, respectively. Two bleached twills showed an average strength loss of 37 per cent. and a fluidity of 21 rhes in the winter exposures, with corresponding figures for the summer of 52 per cent. and 25 rhes, respectively.

Combining data secured from replicate samples exposed for equal periods at different seasons, it was shown that an unbleached 10-oz. cotton duck may be expected to lose on an average 40 to 45 per cent. of its breaking strength after six months' exposure and 60 to 65 per cent. after a year, these reductions being accompanied by fluidity increases up to 16 and 22 rhes, respectively. Unbleached lighter-weight fabrics show somewhat greater strength losses with about the same fluidity increases. Bleached cloth sustains slightly heavier average strength reductions than grey of equal weight, and its degradation is characterized by definitely higher fluidity values at points of equal strength loss.

Siu (R. G. H.). **Fundamental aspects of the prevention of the microbiological degradation of Cotton textiles.**—*Amer. Dyest. Reptr*, xxxvi, 12, pp. 320–323, 1947.

At the Quartermaster Corps Biological Laboratories, Philadelphia, about 200 out of over 10,000 cultures of micro-organisms isolated from deteriorated cotton fabrics have been shown to possess cellulolytic properties. It is doubtful, however, whether all are of great importance under field conditions. For instance, there is as yet no available evidence of outdoor activity by *Myrothecium verrucaria* [see preceding abstract], perhaps the most strongly cellulolytic of all the organisms tested in the laboratory. The moulds predominating in the open include *Memnoniella echinata* and *Chaetomium globosum* [see next abstracts]. The hyphae penetrate the fibre wall into the lumen, where they proliferate and digest the fibre outwards, unlike bacteria, which adhere to the outer surface and pit their way inwards. The organisms secrete cellulose-digesting enzymes of two classes, namely, (1) cellulase, converting cellulose into cellobiose, and (2) cellobiase, transforming cellobiose into glucose.

There are four general lines of approach to the development of preventive methods, i.e., (1) physical exclusion of the organisms from contact with the cellulose molecule, as illustrated by the resistance of resin-impregnated cloth, (2) cell toxicants (fungicides), (3) specific enzyme inhibitors (existing to-day only as a theoretic possibility), and (4) chemical modification of the cellulose molecules on the surface of the fibres into resistant derivatives, which appears to offer great promise of future exploitation.

Illman (W. J.) & Weatherburn (Muriel W.). **Factors affecting the development of mould on Cotton fabrics and related materials.**—*Amer. Dyest. Reptr*, xxxvi, 13, pp. 343–344, 369–372, 5 figs., 2 graphs, 1947.

A study under the auspices of the National Research Council of Canada on the influence of temperature and humidity conditions on mould (including *Memnoniella echinata*, *Stachybotrys atra*, *Metarrhizium glutinosum* [*Myrothecium verrucaria*], and *Chaetomium globosum*) [cf. preceding and next abstracts] growth on various textiles, and on packaging, electric insulation, and miscellaneous materials [*R.A.M.*, xxvi, p. 253] showed that at 86° F. no development occurred at 60 per cent. relative humidity, scarcely any at 70 per cent., and little at 80, but it increased steadily from 85 to 100 per cent. Growth on cotton duck, both untreated and copper naphthenate-treated, was accelerated by the presence of free water. The removal of constituents of unbleached cotton duck by leaching in water (but not in solvents) reduced the incidence of rot. The addition of certain nutrient solutions, viz., salts, dextrose, and lucerne, separately or combined, to the water-leached fabric did not promote mould growth to the same extent as did the untreated cotton duck.

Jones (S. C.). **Immunization of fabrics from moths, rot and mildew.**—*Indian Text. J.*, lvi, 671, pp. 1021–1023, 1946.

The available information concerning the control of rot and mildew (*Metarrhizium* sp., *Chaetomium globosum*, &c.) on fabrics is summarized [see preceding abstracts]. Proofing agents that have undergone practical testing for this purpose include the copper and zinc naphthenates, salicylanilide, and a number of phenolic and mercury compounds; notes are given on their performance and any special advantages or drawbacks connected with their use. A list of other preparations still in the laboratory stage of experimentation is also given and methods for the application and testing of fungicides are outlined.

Benignus (P. G.). **Mildew problems of interest to paint, varnish and lacquer manufacturers.**—*Paint Oil Chem. Rev.*, cx, 7, pp. 10, 30, 34, 1947.

The presence of food materials being essential for mould growth, the use of non-nutrients in the formulation of finishes for paint, lacquer, and varnish is indicated. The following plasticizers applied as protective coatings have been found relatively resistant to fungal infection [cf. *R.A.M.*, xxv, p. 571]: chlorinated phenols (marketed by the Monsanto Chemical Company under the trade name of aroclors), chlorinated paraffin, trinitro-butyl citrate, triethyl citrate, triethylene glycol di-(2-ethyl hexoate), triethylene glycol di-(2-ethyl butyrate), polyethylene glycol, most of the common phosphate and phthalate plasticizers, diethyl succinate, dinitrobutyl tartrate, many sulphonamides and sulphonates, triphenyl guanidine, diamyl naphthalene, and biphenyl with a number of its derivatives. Definitely non-resistant materials include glyceryl triacetate, lauric and oleic acid derivatives, sebacates, ricinoleates, and stearates. Nutrients for moulds are further supplied by coatings incorporating linseed, cottonseed, tall, fish, oiticica, and soy-bean oils, and alkyd or phenolic resins modified with these oils. More resistant are tung, pine, most coal tar, petroleum, and some sulphonated oils.

The chemicals most widely used for the preparation of 'fungicidal' lacquers are organo-mercury compounds, chlorinated phenols, salicylanilide [cf. ibid., xxv, p. 174], and zinc dimethyl dithiocarbamate. Excellent results have recently been obtained with 1 to 2·5 per cent. copper 8-quinolinolate [ibid., xvi, p. 67] (Monsanto's milmer 1) in the manufacture of fungistatic lacquer coatings for use on electronic equipment, which is at present being thoroughly tested by the military authorities under actual service conditions. Wood oil-modified para-phenyl-phenol-formaldehyde air-drying varnishes appear to be quite resistant to mould invasion. Phenolic resin varnishes have been observed to deactivate certain fungicides, notably mercury compounds. Where surface fungicidal activity is required in this type of varnish, 5 to 10 per cent. pentachlorophenol has been found most satisfactory. The same compound or salicylanilide at a comparable dosage may be applied to alkyd resin-base varnishes modified with long oil. Used at a concentration of 1 to 2 per cent., copper 8-quinolinolate or pentachlorophenol have imparted the necessary fungicidal properties to wax compositions and sealing compounds under tropical conditions.

In laboratory experiments ponderosa pine panels were coated with casein paint containing various percentages of sodium pentachlorophenate, and 24 hours after the final application they were sprayed with a spore suspension of moulds isolated from mildewed panels. They were then placed in a humidity chamber, again sprayed with the fungal suspension, the chamber was sealed, and the specimens left for 35 days at 26° C. The control panels included in the test showed heavy mildew growth in a few days, whereas those treated with 0·5 per cent. sodium pentachlorophenate were completely protected. During the war large quantities of casein-base water-dispersible and -emulsifiable paints used for camouflage were

effectively preserved with 2 per cent. santobrite [ibid., xxii, p. 136] or santophen 20 (Monsanto sodium pentachlorophenate and pentachlorophenol, respectively).

The iron oxides commonly used in paints are known to stimulate mould growth, whereas pigments derived from zinc, lead, cadmium, aluminium, chromium, titanium, calcium, antimony, barium, and copper are usually non-nutrients and in some cases fungistatic. For instance, white paints containing a high proportion of zinc oxide are fairly resistant to mildew, while copper and cadmium are used in some applications specifically for their mould-inhibiting properties. When oil paints are used in humid areas it is usually found that the necessary resistance to mildew can be assured only by the addition of toxicants [cf. ibid., xxv, p. 177]. The results of accelerated laboratory and outdoor paint panel exposure tests indicate that certain mercurial compounds at concentrations of 0·2 to 0·5 per cent. are very effective for this purpose, but only for relatively brief periods. In preliminary trials pentachlorophenol and its sodium salt (2 to 5 per cent.) and 3 to 5 per cent. zinc pentachlorophenate have given encouraging results.

In paint-on-wood systems both components should be suitably protected against mildew. Brush, spray, and dip treatments with 5 per cent. pentachlorophenol, dissolved in petroleum oil fractions and containing small amounts of auxiliary solvents and resinous bondings agents, such as aroclor 5460, are widely used for the disinfection of wood.

Hoyt (R. E.) & Levine (M. G.). **A method for determining sensitivity to penicillin and streptomycin.**—*Science*, cvi, 2747, p. 171, 1 fig., 1947.

To overcome the difficulties incidental to the laborious existing methods of determining sensitivity to penicillin and streptomycin, the antibiotics have been incorporated into compressed tablets $\frac{1}{32}$ in. in diameter and 60 mg. each in weight. The most satisfactory base was found to consist of dried and screened dicalcium phosphate, starch, and gum acacia, to which the calculated amount of the dried antibiotic is added and thoroughly mixed. Tablets containing 1, 0·5, and 0·1 Oxford units penicillin and 1, 0·1, and 0·01 mg. streptomycin, respectively, have been prepared. Susceptibility of the test organism is shown by a clear zone round the tablet on agar cultures. Contaminated material can be tested directly without preliminary subculture, contaminations being immaterial.

Wilkins (W. H.). **Investigations into the production of bacteriostatic substances by fungi. Preliminary examination of the fifth 100 species, all Basidiomycetes, mostly of the wood-destroying type.**—*Brit. J. exp. Path.*, xxvii, pp. 140–142, 1946.

Further investigations [cf. *R.A.M.*, xxvi, pp. 24, 258] in which 100 wood-destroying Basidiomycetes were tested for anti-bacterial properties showed the following to be strongly positive against *Bacterium coli* and *Staphylococcus aureus*: *Coniophora cerebella* [*C. puteana*], *Cyathus striatus*, *Daedalea quercina*, *Fomes annosus*, *Lenzites sepiaria*, *Merulius lacrymans*, *M. tremellosus*, *Polyporus betulinus*, *P. eucalyptorum*, *Poria ferruginea-fusca*, *P. vaillantii*, and *P. xantha*; a further 20 per cent. were weakly positive.

Pinto-Lopes (J.). **Variation of the antibiotic power of the Hymenomycetes with the different stages of their life-cycle.**—*Portug. Acta biol.*, Sér. A, i, 4, pp. 409–412, 1946.

Evidence is presented and discussed in support of the author's view that the antibiotic properties of Hymenomycetes [*R.A.M.*, xxvi, pp. 258, 350, *et passim*] vary with the different phases in their life-cycles, represented by mono- or polysporous mycelia, as the case may be [ibid., xxi, p. 301]. It follows, therefore, that both stages should be investigated before the species is pronounced to be

lacking in bacteriostatic activity. Other phenomena to be borne in mind as potential factors in the production of anti-bacterial substances are sexual barriers [ibid., xiv, p. 645], illegitimate combinations (between theoretically incompatible mycelial groups) [ibid., xxvi, p. 313], and the so-called 'geographical races', which are presumed to originate in physiological divergences.

RODE (L. J.), FOSTER (J. W.), & SCHUHARDT (V. T.). **Penicillin production by a thermophilic fungus.**—*J. Bact.*, liii, 5, pp. 565–566, 1947.

A fungus tentatively identified as *Malbranchea* [*Actinomyces*] *pulchella* [*R.A.M.*, xx, p. 302] has been found to produce penicillin at 52° C., at potencies ranging from 1 : 64 to 1 : 128 against *Staphylococcus aureus*.

KELNER (A.), KOCHOLATY (W.), JUNOWICZ-KOCHOLATY (RENATE), & MORTON (H. E.). **Two antibiotics produced by Actinomyces isolated from soil.**—Abs. in *J. Bact.*, li, 5, pp. 591–592, 1946.

Two antibiotics active against a number of Gram-negative and Gram-positive organisms were obtained at the University of Pennsylvania, School of Medicine, from soil-inhabiting species of *Actinomyces* designated A 10 and A 105, of which the former is tentatively identified a member of the *A. lavendulae* [*R.A.M.*, xxiv, p. 463] group and the latter as a variant of *A. erythreus* or a new species. Chemical purification resulted [see next abstract] in a 40- to 50-fold increase in efficiency calculated on a dry-weight basis.

JUNOWICZ-KOCHOLATY (RENATE) & KOCHOLATY (W.). **Two antibiotics (lavendulin and actinorubin) produced by two strains of Actinomyces. II. Purification and isolation.**—*J. biol. Chem.*, clxviii, 2, pp. 757–764, 1947.

The two antibiotic principles isolated from soil-inhabiting *Actinomyces* spp. [see preceding abstract] have been isolated as crystalline helianthates and named lavendulin and actinorubin. Only tentative formulae for their composition can be established at the present juncture. Their chemical characteristics and reactions and anti-bacterial spectra present some analogies with streptothricin.

JUNOWICZ-KOCHOLATY (RENATE), KOCHOLATY (W.), & KELNER (A.). **Sulfactin, a new antibiotic substance produced by a soil Actinomyces.**—*J. biol. Chem.*, clxviii, 2, pp. 765–769, 1 fig., 1947.

From cultures of an *Actinomyces*, possibly a variant of *A. roseus* or a new species, a new antibiotic substance, designated sulfactin, has been obtained in crystalline form. In Dr. H. E. Morton's experiments at the University of Pennsylvania, School of Medicine, 1 ml. of the crude culture was non-toxic to mice, and the purified substance has a favourable ratio of therapeutic to toxic dose.

BARRETT (J. T.). **Observations on the root endophyte, Rhizophagus, in culture.**—Abs. in *Phytopathology*, xxxvii, 5, pp. 359–360, 1947.

None of the many previous records of the occurrence and investigation of the *Rhizophagus* type of endophyte [*R.A.M.*, xxiii, p. 402] in the roots of various plants presented information on the successful establishment of the organism in culture, though in a few cases slight growth was made. The writer obtained a *Rhizophagus* culture from garden pea roots [? in California] by placing a fragment of boiled hemp seed directly on a few hyphae attached to a piece of diseased root in water. New growth appeared in a few days on the fragment of seed, which was transferred to a Petri dish containing sterile tap water with a fresh half of boiled hemp seed submerged in the centre. Within ten days the typical vesicular mycelium of the endophyte had covered the bottom of the dish. The organism was then

established on water agar plus a modicum of water from autoclaved hemp seed and other media, thus becoming available, for the first time, for intensive biological and taxonomic study.

Large (E. C.) & Beer (W. J.). **Field trials of copper fungicides for the control of Potato blight. III. Low-copper fungicides.**—*Ann. appl. Biol.*, xxxiii, 4, pp. 406–413, 2 graphs, 1946.

In further field trials on the control of potato blight (*Phytophthora infestans*) by means of copper fungicides [cf. *R.A.M.*, xxv, p. 470] carried out on trial plots at Beaford, north Devon, and Galmpton, south Devon, in 1945, the following sprays were tested comparatively against both early and late infection: Bordeaux mixture (4–5–40) freshly prepared from granulated copper sulphate and hydrated lime (0·25 per cent. copper), the same at half-strength and quarter, ialine colloidal copper compound, a colloidal suspension of basic copper carbonate in paste form (5 lb. per 100 gals.), bouisol, a liquid colloidal suspension of copper oxychloride (4·17–100), perenox, a dispersible preparation of yellow cuprous oxide in powder form (1·25–100), yellow cuprocide, a similar preparation (0·75–100), fungex, a liquid cuprammonium compound (5·7 pt. per 100 gals.), the last five all containing 0·063 per cent. copper, dithane 14, a solution containing 3 lb. disodium ethylene bis-dithio-carbamate per U.S. gal. used at 4 pt. plus 1 lb. zinc sulphate and ½ lb. hydrated lime per 100 gals. to introduce a light flocculum into the spray fluid and improve adhesion, the zinc sulphate and lime were also used apart from the dithane to test for possible fungicidal effect of their addition to it, and lime-sulphur (1 in 50). All the copper fungicides were tested with and without an adhesive of the calcium caseinate-rosin soap type.

Precautions were taken to avoid confusion of the observations by concurrent mineral deficiency and virus disorders, and the treatments were compared according to three criteria: direct foliage protection, spray retention, and indirect effect on yield. Two applications were given at Galmpton and three at Beaford.

In both trials all the proprietary copper fungicides gave less efficient foliage protection than did 1 per cent. Bordeaux mixture and all showed inferior resistance to washing off by rain both when used alone and with a spreader and sticker. Also, none of them gave any significantly better protection than 0·25 per cent. Bordeaux mixture, which with thorough spraying and timely application afforded sufficient protection for the production of almost a full crop.

It would seem that in horticultural practice, where spraying can be carried out thoroughly at well-chosen times, satisfactory control of potato blight will result from only a few applications of almost any copper fungicide with copper dosage as low as that of 0·25 per cent. Bordeaux mixture. In agricultural practice, however, it would seem preferable to select a copper funcigide with the greatest possible resistance to washing off by rain, and to use it at 0·25 per cent. copper content.

Dithane 14 was more effective at 1 in 200 than lime-sulphur at 1 in 50, and this was not due to the zinc sulphate and lime, which, used alone, had no effect. Three applications of dithane 14, however, were inferior in protecting power 0·25 per cent. Bordeaux, and it would appear that weekly applications of dithane would be necessary to secure control.

Black (W.) & Haigh (J. G.). **Strains of Potato blight in Scotland.**—*Scot. J. Agric.*, xxvii, 1, pp. 49–50, 1947.

Three strains of *Phytophthora infestans* [*R.A.M.*, xxvi, p. 428] have been isolated by the Scottish Plant Breeding Station. The common strain, A, occurs in the field on commercial varieties of potatoes; strains B and C have appeared only on trial plots of seedling selections resistant to strain A, and they are, therefore, more virulent than A. Since all British potatoes of commercial origin are suscep-

tible to the common strain, more detailed examination is necessary to show whether strains B and C occur in the field or are confined to experimental material.

Test leaves, the reactions of which to the three strains were known, were inoculated with conidial suspensions from 37 samples of blight-infested material from 25 Scottish counties, and two samples from the trial plots. The varieties providing the test leaves were 1258a (19) and 882 (5), immune from all three strains of *P. infestans*, 887a (34), immune from A and B, susceptible to C; 655 (43), immune from A and C, susceptible to B; and King Edward, susceptible to all. In all 39 tests King Edward leaves were attacked. The other leaves remained unaffected except for one test on 655 (43), which was infected by material from a seedling known to be susceptible to B.

It appears, therefore, that only strain A occurs in field and that the more virulent strains arise by the modification of the A strain to suit a new gene complex. This modification probably requires several seasons to become effective under natural conditions. *Solanum demissum* has so far resisted the attacks of the most virulent strains of *P. infestans*.

Koch de Bertelli (Lucia). **La Peronospora o mildiu de la Papa. (Phytophthora infestans (Mont.) de Bary).** [Potato *Peronospora* or mildew (*Phytophthora infestans* (Mont.) de Bary).]—*Publ. mens. Direcc. Agron. Urug.* 87, 16 pp., 6 col. figs., 1946.

First observed in Uruguay by A. M. Guarch, in 1914 and for the second time in 1922, potato late blight (*Phytophthora infestans*) did not reappear until the spring of 1938, when it assumed a virulent form in the environs of Montevideo. The next outbreak occurred towards midsummer of 1941, a more severe one was recorded in the autumn of 1943, while in the latter half of March and again in October and early November, 1944, the pathogen renewed its attacks with great intensity. During the latter period tomatoes were also mildly affected. A wild potato, *Solanum boergerii*, was heavily infected by *P. infestans* in 1944. The fungus developed on early crops in September, 1945.

The symptomatology of the disease is described, Sorauer's account of the perpetuation of the fungus through the tubers (Handbuch der Pflanzenkrankheiten, II, 1921) is translated into Spanish, the problems relating to breeding for resistance to late blight are discussed, the available information on the pathogen and the factors affecting it in Uruguay is summarized, and full directions are given for control by sanitation and spraying with Bordeaux mixture.

Tottingham (W. E.), Nagy (R.), Ross (A. F.), Marek (J. W.), & Clagett (C. O.). **Blackening indices of Potatoes grown under various conditions of field culture.** —*J. agric. Res.*, lxxiv, 5–6, pp. 145–164, 1 graph, 1947.

The influence of climatic and cultural conditions and potato varieties on the blackening of potatoes after boiling [*R.A.M.*, xxvi, p. 261 and next abstract] was studied in a number of tests over a period of nine years at the Wisconsin Agricultural Experiment Station. They showed no single factor or combination of factors to be uniformly responsible for blackening; rather, they emphasized the complexity of the factors governing this response of the tubers.

Potassium, especially when used in large quantities, sometimes decreased blackening noticeably. Otherwise there was no substantial evidence that mineral nutrition affects the colour, but climatic factors evidently have some influence. The data were not, however, sufficiently consistent to permit a precise definition of the conditions that cause discoloration. Blackening was prevented by exposing susceptible tubers to 100° F. for three to four days.

Chippewa, Triumph, and Sebago potatoes rarely cooked black regardless of the conditions under which they were produced; on the other hand, Rural New Yorker, Irish Cobbler, and some other varieties frequently blackened.

Lewis (W. R.) & Doty (P. M.). **Partial characterization of a compound involved in the blackening of white Potatoes.**—*J. Amer. chem. Soc.*, lxix, 3, pp. 521–523, 1947.

A colourless, fluorescent precursor of the pigment causing a greyish or black discoloration of potatoes on cooking [*R.A.M.*, xxv, p. 317 and preceding abstract] has been isolated at the Indiana Agricultural Experiment Station. It is unsaturated and contains a carbohydrate and a nitrogenous group, the latter being probably an amino-acid or a peptide, but neither tyrosine nor tryptophane. The absorption curve of the precursor attains a maximum at 2,800 Å.

Peklo (J.). **Z boje proti infekčním chorobám Bramborů : strupovitosti, vločkovitosti a plísni Bramborové.** [On the control of the Potato fungi; powdery scab, black scurf and stem canker, and blight.]—*Zem. Arch.*, xxxii, 9–10, pp. 505–534, 2 plates, 1941. [German summary. Received May, 1947.]

The tests described in this paper were conducted during 1932–1939 in the potato-growing region of Czechoslovakia, the hills of Českomoravská vysočina. Two susceptible potato varieties were used, the table Zločen and the starch Škrobáky. The fields were infested with *Spongospora subterranea*; *Phytophthora infestans* and *Rhizoctonia* [*Corticium*] *solani* both developed severely. The scabs of *S. subterranea* may become breeding places of the last-named organism. These secondary diseases were usually more severe than the original powdery scab. *Actinomyces scabies* was also found on the powdery scab affected tubers and some of the experiments indicated that *S. subterranea* promoted an attack by the former, which was followed by virulent infection by *C. solani*.

One part of the field where the control experiments took place was predisposed to *S. subterranea* by its chemical and physical qualities; the other part was free from it. The ordinary mineral fertilizers had no effect on the control of the disease. This was achieved effectively by ammonium sulphocyanate (12 quintals per ha.) which destroyed at the same time *P. infestans*, *C. solani*, and *A. scabies*, the yield being 77·8 q. per ha. Some damage was caused to the plants by this fertilizer and its price is unfortunately high. The result shows the mechanical relationship of all these potato diseases to powdery scab.

C. solani was controlled to a great extent by hot formalin disinfection of the tubers (0·3 per cent. at 50° C. for 2½ minutes). An experiment in 1939 showed an increase in yield of 10 per cent. by this method. In a test, pure-culture basidiospores isolated from the *Hypochnus* [*C.*] stage were used in different combinations for the infection of three potato varieties. They showed the marked genetic variability of the fungus and this accounts for the difficulty sometimes experienced in its control.

Thomas (W. D.). **Growth and variation of six physiologic races of Actinomyces scabies on different culture media.**—*Phytopathology*, xxxvii, 5, pp. 319–331, 1947.

Six physiologic races of *Actinomyces scabies* from various types of scab pustules on Irish Cobbler potatoes [*R.A.M.*, xvii, p. 766] at the Minnesota Agricultural Experiment Station differed conspicuously in pathogenicity on the varieties Arnica, Earlaine, and Hindenburg and seven selections [cf. ibid., xxvi, p. 260].

The best sources of carbon for the growth of these races were sucrose, cellulose, inulin, and maltose. Nitrogen and phosphorus generally promoted their develop-

ment, while potash tended to retard it. Spergon and thiosan (1 in 1,000) showed some degree of specificity in their action on the several races, the former totally inhibiting the more pathogenic 11 and 39 and permitting only scanty development by 49, while the latter suppressed 39 and severely limited the growth of 11, 48, and 49; mycelial production in the other races was not materially impaired by the compounds. None of the races grew in the presence of semesan bel, corona PD–7, or yellow mercuric oxide (all at 1 in 1,000), but No. 47 survived the addition to the medium of mercuric chloride at 1 in 10,000 [ibid., xiii, p. 466]. *Trichoderma lignorum* [*T. viride*] extract arrested the growth of races 11 and 49 and *Penicillium digitatum* extract inhibited 48, both also acting adversely on the other races. All the races grew poorly in the presence of a filtrate of *Melanconium putredinis*, *Aspergillus niger* substantially reduced mycelial production in 11, 39, 46, and 47, while only 11 withstood the detrimental effects of *Rhizoctonia* [*Corticium*] *solani* extract. Scanty growth was made by all the races on media containing clay-loam extracts, peat favoured 46 and 47, while 11, 39, 46, and 49 developed better on sand.

The production of variants was considerably influenced by differences in the source of carbon, mannose, starch, and sucrose promoting sector development in all the races while cellulose discouraged it. Race 48 produced two sectors of variant type 8, characterized by an ochraceous-salmon mycelium, no aerial growth, and smooth topography, on *A. niger* extract medium, while 49 formed one each on media incorporating filtrates of *P. digitatum* and *C. solani*. Race 49 was variable on peat and clay loam extracts, while 11, ordinarily the most stable of all, gave rise to nine sectors on sand. When the six races were reisolated from the tubers on the termination of the pathogenicity tests, those inoculated with 11, 47, and 49 gave rise to variant type 4, which colours the medium salmon-orange and makes a dark gull-grey aerial growth, the colonies being smooth. The more pathogenic races 11 and 39 were the most stable, while the tendency of the others to form sectors of the same type may point to a close affinity between them.

Kramer (M.). **A 'sarna prateada' da Batatinha.** [Silver scurf of Potato.]—*Biológico*, viii, 3, pp. 83–86, 2 pl., 1942. [Received July, 1947.]

Silver scurf of potato (*Spondylocladium atrovirens*), which formerly attracted little attention in São Paulo, Brazil, has assumed considerable importance of recent years, especially in the regions of Cotia and São João de Bôa Vista. Not only may the fungus itself be responsible for heavy losses, but it paves the way for the infection of the tubers by secondary parasites. Promising results in the control of the disease have been obtained at one of the State experiment stations by 1½ hours' immersion of the tubers in 1 per cent. mercuric chloride. Other precautions should include tri- to quadrennial crop rotation; storage in a well-ventilated room with due regard to correct temperature and humidity; timely harvesting (as soon as the tubers reach maturity) to forestall the development of a large number of lesions before storage; planting in dry soils on elevated sites; and the rejection for seed of severely infected tubers, the use of those with less extensive lesions being permissible after treatment.

Sherf (A. F.), Page (R. M.), Tullis (E. C.), & Morgan (T. L.). **Studies on factors affecting the infectivity of Helminthosporium oryzae.**—*Phytopathology*, xxxvii, 5, pp. 281–290, 1 fig., 1947.

Previous studies on the relation of environmental factors to the pathogenicity of the agent of brown spot of rice (*Helminthosporium oryzae*) [*Ophiobolus miyabeanus*: see next abstract] have been carried out on oriental collections of the fungus which may represent a different physiologic race from that occurring in the United

States [*R.A.M.*, vii, p. 55]. The wide distribution and severity of the disease were considered to justify a further investigation of this aspect of its etiology.

Methods are described for the production of inoculum from the vegetative mycelium or from conidia of the imperfect state, *H. oryzae*, for experimental use in the greenhouse and field. The mycelium was grown in 4-l. pyrex bottles on 3 l. of a sterilized solution consisting of 10 per cent. (by volume) blackstrap molasses and 0·5 per cent. peptone per bottle. The bottles were inoculated with 2 ml. of an aqueous suspension of conidia and incubated at 27° to 31° C. for six days, during which aeration was affected by the introduction of sterile air at 1,500 ml. per minute. The mycelium was filtered and the filter cake broken up and dried at 40° for 24 hours, the resulting product being ground in a Wiley mill to yield a dust. The conidial inoculum was produced on steamed, sterilized oats and rye. Fernbach flasks containing 300 gm. of these seeds were inoculated with an aqueous suspension of conidia and incubated at 22° to 24° in the dark for 14 days. Three to five 200-ml. portions of water were added singly to the flasks, vigorously shaken, and the resultant conidial suspension strained through wire gauze into cylinders after each addition. After standing overnight at 8° the supernatant liquid was decanted from the cylinders and the concentrated conidia collected in a funnel on coarse filter paper. The filter cake was broken up and dried in a steam oven for 24 hours at 40°. Some 3 to 4 gm. conidia of 96 to 97 per cent. germinability were thus obtained from each 300-gm. sample of dry substratum. Both the conidial and mycelial dust were used with a limestone filler. Generally speaking, the conidia were five to ten times more efficient than the mycelium in the initiation of infection. Disease-free seed of the susceptible Onsen and Butte varieties was readily obtainable for experimental purposes; for other varieties Nisikado and Miyake's hot-water treatment (*Ber. Ōhara Inst. landw. Forsch.*, i, pp. 543–555) was applied.

The maintenance of the plants under conditions of high humidity prior to inoculation failed to predispose them to infection [cf. *R.A.M.*, xvii, p. 343] but promoted its development owing to the presence of free water on the leaves. A 10-hour period of abundant moisture after inoculation was requisite for optimum infection at 22° [cf. ibid., xi, p. 536]. Rain reduced the incidence of brown spot by washing the inoculum from the foliage. The optimum temperature for infection ranged from 20° to 25°, with a maximum at 30° [loc. cit.]. In the field more severe infection resulted from inoculations between 8.30 and 9.30 p.m. than in the early morning or at noon. The plants were susceptible to foliar infection at all stages of growth, and none of the 20 varieties used in greenhouse tests showed appreciable differences in resistance to brown spot. The conidia remained viable for 28 days on the leaf under favourable greenhouse conditions.

Page (R. M.), Sherf (A. F.), & Morgan (T. L.). **The effect of temperature and relative humidity on the longevity of the conidia of Helminthosporium oryzae.**—*Mycologia*, xxxix, 2, pp. 158–164, 4 graphs, 1947.

Helminthosporium oryzae [*Ophiobolus miyabeanus*: see preceding abstract] has been shown to possess extensive longevity in culture [*R.A.M.*, ii, p. 230]. These experiments conducted at Camp Detrick, Maryland, during 1944 were to determine first the effect of temperature, then of controlled temperature and relative humidity combined, on the longevity of the conidia grown on moistened, sterilized oats. The results showed that viability was retained best at low temperatures at all relative humidities; 81 per cent. of the conidia were still viable after storage for 100 days at 2° C. and only 6 per cent. at 31°. The relative humidity during storage had more influence on longevity than temperature alone; for example, at 20 per cent. relative humidity and 31° the conidia survived for six months whereas at 95 per cent. and 31° they lost their viability after one month. It does not seem

likely, therefore, that the conidia would survive for long either in the warm, moist climates of the rice growing regions or in the winter under field conditions.

STARR (M. P.). **The causal agent of bacterial root and stem disease of Guayule.**—*Phytopathology*, xxxvii, 5, pp. 291–300, 1 fig., 1947.

The name proposed for the bacterium responsible for a stem and root disease of guayule (*Parthenium argentatum*) in California [see preceding abstract] is *Erwinia carotovora* f. sp. *parthenii* n.f.sp. The morphology, staining, reactions, and cultural characters of the guayule pathogen on various media are fully described. It differs from *E. carotovora* only in some cultural properties, e.g., in the production of indole, the peptonization of milk, the failure to grow on sterilized potato, and its ability to attack guayule. Inoculation experiments on guayule with *E. carotovora* from other hosts, as well as with *E. oleraceae* from cauliflower, *E. rhapontici* from rhubarb, and *E. solanisapra* and *E. atroseptica* [*E. phytophthora*] from potato gave negative results, whereas the plants infected with *E. carotovora* f. sp. *parthenii* rapidly succumbed to the typical stem and root rot.

CAMPBELL (W. A.). **A bacterial root and stem disease of Guayule.** *Phytopathology*, xxxvii, 5, pp. 271–277, 1 fig., 1947.

The pathogenicity of the *Erwinia* responsible for the bacterial rot of guayule (*Parthenium argentatum*) [*E. carotovora* f. sp. *parthenii*: see preceding abstract] already reported from California [*R.A.M.*, xxvi, p. 169] was demonstrated by greenhouse inoculation experiments. The average times required for the complete wilting of infected plants at 75°, 80°, and 85° F. were 7, 7, and 8 days, respectively. At 70°, 89°, and 98° the appearance of the symptoms was delayed and below 60° the wounds healed without infection.

The bacteria were shown by histological examination of the diseased tissues to be confined to the cortical cells, which rapidly disintegrated under the influence of the pathogen, permitting the ready separation of the bark from the stems.

TCHAN (Y. S.). **Microbiologie du sol ; une nouvelle technique de microscopie directe.** [Microbiology of the soil; a new method of direct microscopy.] *Ann. Inst. Pasteur*, lxxiii, 7, pp. 695–696, 1947.

The following simple method has proved very serviceable in the examination of soil samples. A portion of the soil to be tested is placed in a Petri dish and after incubation at 28° C. the top layer is transferred to a flamed slide, and stained with phenicated erythrosine, which results in good differentiation of bacterial and fungal colonies, including Actinomycetes.

ERIKSON (DAGNY). **Differentation of the vegetative and sporogenous phases of the Actinomycetes. 1. The lipid nature of the outer wall of the aerial mycelium. 2. Factors affecting the development of the aerial mycelium.**—*J. gen. Microbiol.*, i, 1, pp. 39–52, 3 plates, 1947.

It appears that it is the presence of lipid substances in the outer walls of the aerial mycelium of Actinomycetes which gives it a characteristic dry, powdery appearance and causes difficulty in wetting the constituent spores. These substances, which are probably glyceride in nature, can be removed by fat solvents and wetting agents or destroyed by alkali. The lipid-containing aerial mycelium is readily distinguished from the vegetative mycelium by staining with Sudan IV in ethanol.

Soil Actinomycetes which consistently produce aerial spores in surface colonies when first isolated on soil extract agar retain this property when maintained in

sterile soil or when grown in a water agar medium on washed suspensions of living or dead common soil bacteria. Aerial growth in soil is best initiated by aeration at constant composition, moisture content, and temperature. The quantity of the inoculum and whether it is sporogenous or vegetative, and, within a broad range, the pH of the soil, are minor factors. Dehydration is very important for stimulating sporulation once growth is well established. The types of growth of different Actinomycete strains in natural and sterilized soils and in a synthetic soil containing 250 p.p.m. of nitrogen as nitrate are similar and generally uncharacteristic of their species.

Singh (B. N.). **Studies on soil Acrasieae. 1. Distribution of species of Dictyostelium in soils of Great Britain and the effect of bacteria on their development.**—*J. gen. Microbiol.*, i, 1, pp. 11–21, 1 pl., 1 fig., 1947.

An isolation method using silica jelly revealed the common occurrence of *Dictyostelium* spp. in arable soils. Apparently only *D. mucoroides* and another *D.* sp. are commonly found in the soils of England, Wales, and Scotland although from the last-named only a few samples have so far been examined. No correlation between the pH of the soil and the distribution of *D.* spp. was found in soils ranging from pH 4·3 to 7·8. Their presence in the classical plots at Rothamsted, where no fertilizers or only artificial ones had been added for over 100 years, disproves the earlier belief that species of *Dictyostelium* are dung organisms.

Krejbohm de la Vega (G. A.). **Situación actual de las variedades de Caña de Azúcar con relación a la plaga del 'carbón'. Susceptibilidad demostrada por las variedades cultivadas en la Estación Experimental Agrícola.** [Actual situation of Sugar-Cane varieties in relation to the 'smut' disease. Susceptibility shown by the varieties cultivated at the Agricultural Experiment Station.]—*Bol. Estac. exp. agríc. Tucumán* 61, 40 pp., 3 graphs, 1947.

The present position as regards the reactions to sugar-cane smut [*Ustilago scitaminea*] of the varieties grown at the Tucumán (Argentina) Agricultural Experimental Station [*R.A.M.*, xxv, p. 524] is fully described and the pertinent statistical data set out in tabular form. Of 39 varieties recommended in 1944 for the rehabilitation of diseased plantations, seven (Tuc. 630, 1238, 1296, 2605, 2704; P.O.J. 2878 and 2961) are still smut-free, while the remainder have contracted infection of varying degrees of severity.

[McMartin (A.).] **Experiment Station notes. New Cane varieties. Control of disease.**—*S. Afr. Sug. J.*, xxxi, 6, pp. 373–374, 1947.

Very few cases of sugar-cane mosaic have as yet been found by the South African Government inspectors in their new season's survey in the Mount Edgecombe district of Natal [*R.A.M.*, xxvi, p. 420], but at Umzinto the disease is still widespread, almost every field examined containing a number of infected canes (less than 1 to 17 per cent.). Some stools of N: Co. 310, which were formerly infected by the virus, have completely recovered: a similar observation was previously made in connexion with N: Co. 79, while diseased stools of Co. 301 may produce some healthy shoots.

Smut [*Ustilago scitaminea*] appears to be still restricted to the Tongast area where it was originally detected [ibid., xxiv, p. 290]. The pathogen is reported to have been causing serious damage of late in Portuguese East Africa and Rhodesia. In the latter country all Co. 301 is affected and its propagation has been discontinued on Incomati Estates, largely on this account; the disease has further been noted on N: Co. 310.

Camp (W. H.), Rickett (H. W.), & Weatherby (C. A.). **International rules of botanical nomenclature.**—*Brittonia*, vi, 1, pp. 1–120, 1947.

This is an unofficial special edition of the Rules, including the changes made by the International Botanical Congress at Amsterdam in 1935 and an alphabetical index to conserved and rejected names of genera as well as those proposed for conservation or rejection. Since the official edition of the Rules included only the changes made at Cambridge in 1930, and for some years has been unobtainable, this new, complete edition will be useful to all botanists.

Kleineberger-Nobel (Emmy). **The life cycle of sporing Actinomyces as revealed by a study of their structure and septation.**—*J. gen. Microbiol.*, i, 1, pp. 22–32, 3 pl., 14 figs., 1947.

This is an interesting study of four sporing Actinomycetes [*R.A.M.*, xxiii, p. 119]: *Actinomyces gardneri*, *A. albosporeus*, *A. chromogenes*, *and A. madurae* [ibid., xxv, p. 185].

The spore contains a round chromatinic body and cytoplasm enclosed in a spore case and germinates by sprouting in succession one to three or rarely four tubules. The first ones are always slender and irregularly twisted and undulating, a feature often found in fungal hyphae but not in bacteria. The nuclear body of the spore divides into two structures, partition products of which enter the germination tubules. The primary mycelium develops further by stretching and sprouting accompanied by division of its small nuclear bodies found in all side branches. At first no transverse septa are formed but soon the whole primary mycelium is composed of compartments of different length divided from each other by delicate transverse septa. These septa can be demonstrated only by the tannic acid-crystal violet method. In older hyphae the septa are more widely spaced. The primary mycelia differ sharply from the secondary in that they never divide into single cells. When the young primary mycelium is well developed, agglomerations of hyphae appear in the form of skeins, networks, and scrolls, first at the centre of the colony and later at the periphery. Where two parts of one, or two different filaments touch each other, brightly staining new elements called 'initial cells' arise, which consist of dark nuclear bodies surrounded by cytoplasm and later enclosed by a cell wall. It is probable that at the point of contact of the filaments the contents of two cells fuse together so that the initial cell may be regarded as a fusion cell. This condensation of filaments is a constant feature of the four *Actinomyces* spp. so far examined.

The initial cells grow into the secondary mycelium by a process of sprouting and subdivision of cells. The secondary hyphae are composed of fairly long, cylindrical cells, each containing a deeply staining, cylindrical mass of nuclear material, and are subdivided by well-defined and easily demonstrable transverse septa. The hyphae, which are straight and less profusely branched than the primary ones, often break up into single cells, particularly in certain species and on certain media. These cells have exactly the same structure as those of the hyphae and are able either to grow out again into a new secondary mycelium or to form spores. Spore formation is preceded by division of the nuclear cylinders in the cells of the secondary mycelium. The products of this division are of definite shape and their arrangement seems to follow a regular pattern. Whereas the nuclear cylinders occupy a longitudinal position in the cells, the small, rod-like or dumb-bell structures derived from them lie across the cells, singly or more often in pairs, either parallel to one another or in V- or X-like configurations. Just as the cell of the secondary mycelium resembles the fusion cell of certain spore-bearing bacteria, so the small rod-like structures resemble the bacterial 'chromosomes'. During these nuclear changes new septa are formed subdividing the large compartments into smaller ones, each of which corresponds to a single spore.

Moesz (G. v.). **Fungi Hungariae. IV, Basidiomycetes—Pars 1, Uredineae, Finis.** [Fungi of Hungary. IV, Basidiomycetes—Part 1, Uredineae, Conclusion.]—*Ann. hist. nat. Mus. Hung.*, Pars bot., xxxv, pp. 73–87, 1942. [Received May, 1947.]

This final instalment of the author's critical studies on the Uredineae of Hungary [*R.A.M.*, xxvi, p. 80] is an index of hosts in alphabetical order of their botanical names.

Jørstad (I.). **Coccosporium aucupariae and Mastigosporium deschampsiae, two new Fungi Imperfecti.**—*Forh. VidenskSelsk. Krist.*, xix, 8, pp. 25–28, 2 figs., 1947.

Coccosporium aucupariae n. sp. forms on the bark of mountain ash (*Sorbus aucuparia*) twigs near Trondhjem, Norway, coal-black, pulvinate, hirsute, fragile, purely superficial coatings. It is characterized by erect, congested, fuscous, simple or branched, septate hyphae, 8 to 13·5 μ in diameter, giving rise to globose or irregularly ovoid, multicellular, deciduous conidia, 16 to 45 by 16 to 35·5 or up to 130 by 75 μ, which may either be pleurogenous and sessile or acrogenous on short branches simulating conidiophores or on long hyphae.

Deschampsia caespitosa in different parts of the country is parasitized by *Mastigosporium deschampsiae* n. sp., which forms elliptical, brown or dingy purple spots with paler centres on the leaves. Its conidia are hyaline, ellipsoid, rounded or sometimes tapering at the apex, measure 40 to 68 by 15·5 to 20 μ, and are furnished with 4 to 7 (mostly 6) septa.

Smith (A. H.). **North American species of Mycena.** xvii+521 pp., 99 pl., 56 figs. Univ. of Michigan Press (and Oxford Univ. Press), 1947. $6.00.

In this excellent monograph the author interprets *Mycena* in a rather broad sense and emphasizes microscopic characters in his taxonomic treatment. Notes are given on habitat, seasonal occurrence, field work, laboratory technique, chemical tests, etc. In the United States and Canada 218 species and 14 varieties are recognized, but only 19 species are included from tropical America since much more work is needed before tropical species can be evaluated. Notes are given on excluded and doubtful species, followed by a bibliography and an index.

Gadd (C. H.). **The collection of blistered leaves.**—*Tea Quart.*, xix, 1, pp. 17–20, 1947.

The author describes in popular terms the method of infection of tea leaves by spores of *Exobasidium vexans* [*R.A.M.*, xxvi, p. 358] adhering to their lower surfaces, and advances the theory that the disease arrived in Ceylon as spores carried through the air from South India. Although there is no proof to support this, the disease was undoubtedly rapidly distributed through the tea areas of Ceylon, even to Uva, by air currents. As sprays are impracticable except for use in nurseries it is suggested that in the plucking gardens the best method of control is to have short rounds with hard plucking of the young uninfected shoots. The old blisters will then die without much likelihood of re-infecting. Collection of blistered leaves cannot keep pace with the formation of new blisters, unless these are few and the weather conditions are unfavourable to the fungus, and is considered a waste of labour.

Tubbs (F. R.). **Blister blight.**—*Tea Quart.*, xix, 1, pp. 23–26, 1947.

This was a lecture delivered before the Nuwara Eliya Planters' Association on 15th May 1947, and deals with the subject of pruning, tipping, spraying, and

plucking of tea in Ceylon in relation to weather conditions when there is an outbreak of *Exobasidium vexans* [see preceding abstract]. It is recommended that the pruning programme should be adjusted so that bud-break occurs at the beginning of the dry period, pruning should be light, and pruned bushes should be tipped successionally as the shoots come up to the chosen level.

SCHACHMAN (H. K.). **Viscosity studies on the association of Tobacco mosaic virus.**—*J. Amer. chem. Soc.*, lxix, 8, pp. 1841–1846, 4 graphs, 1947.

Viscosity measurements on preparations of the rib grass [*Plantago lanceolata*] strain of the tobacco mosaic virus [*R.A.M.*, xxi, p. 227 *et passim*] from young diseased Turkish tobacco plants indicate that it possesses a high degree of resistance to aggregation as compared with the ordinary strain. One preparation contained very few aggregated particles after four years' storage in distilled water.

REITSMA (J.), SLOOF (W. C.), & THUNG (T. H.). **Frog-eye and barn spot on Tobacco leaves caused by Cercospora nicotianae Sacc. et Sydow.**—*Chron. Natur.*, ciii, 6, pp. 94–98, 4 figs., 1947.

From a comparison of the descriptions of frog eye and barn spot diseases of tobacco [*R.A.M.*, xi, pp. 129, 134; xv, p. 612] with the actual diseases the authors consider it would be justifiable to conclude that frog eye is caused by *Cercospora raciborskii* and barn spot by *C. nicotianae*. Their experiments showed, however, that the same fungus can produce both kinds of spots.

Leaves with typical frog eye spots were kept in a closed Petri-dish for three days. The yellowish-white centres gradually darkened, the margins becoming broader, darker, and more indefinite, thus closely resembling typical barn spots. On the first day conidia were observed which were broadened or swollen at the tip. They were never acute, even on the third day. The conidiophores on the first day were similar to those of *C. raciborskii* but much longer, 168 to 224 by 4·2 to 5·6 μ. After two days samples taken from the same spot showed conidiophores of the same size as those of *C. nicotianae*. On the third day, after the introduction of wet cotton-wool, the appearance of the fungus completely changed. The conidiophores had grown to 600 by 7 μ, raising the number of their septa to 12, 17, even to 22. The conidia had reached a maximum length of 200 μ and the septa increased to 12 to 16. They had lost the swollen appearance of their apices. Three groups of conidiophores could be distinguished: the first nearly 200 μ long with five, six, or seven septa, the second nearly 400 μ with 12 to 17, and the third up to 600 μ with 21 or 22.

These observations show that surrounding conditions affect the appearance of the fungus. Very moist conditions lead to the development of the form known as *C. nicotianae* within three days, whereas an increase of humidity after a period of dry weather will cause the development of the *C. raciborskii* form.

The authors conclude that the separation of the *Cercospora* fungus into two species cannot be maintained. The name *C. nicotianae* is retained for reasons of priority and in order to obtain a complete description of it the detailed description of *C. raciborskii* given by Solheim and Stevens [loc. cit.] must be added.

BAINES (R. C.). **Perennial Nightshade, a host for Corynebacterium michiganense.**—Abs. in *Phytopathology*, xxxvii, 5, p. 359, 1947.

A bacterium resembling *Corynebacterium michiganense* was isolated from stem cankers on perennial nightshade (*Solanum douglasii*) in a tomato field in southern California in 1944. Inoculation tests with the nightshade strain produced typical infection both on the same host and tomato, whereas an isolate from the latter was pathogenic to tomato only. The organism overwintered on *S. douglasii*.

Truter (Susarah J.). **Een voorlopig onderzoek naar de insterving van Alnus glutinosa [L.] Gaertner.** [A preliminary investigation on the die-back of *Alnus glutinosa* (L.) Gaertner.]—Thesis, Univ. Utrecht, 110 pp., 9 pl., 1 graph, 1 chart, 1947.

As in Denmark (E. Rostrup, Plantepatologi, Copenhagen, 1902), Belgium, and Germany [*R.A.M.*, xv, p. 540], alders in Holland suffer from die-back. Fructifications of the following fungi were found on the dead bark of trees in the van Heloma polder: *Valsa oxystoma*, *Pezicula cinnamomea* (DC.) Sacc., *Cryptospora suffusa* (Fr.) Tul., *Melanconium stromaticum* Cda, *Diaporthe alnea* Fuck., *Dendrophoma* sp., and *Phoma* sp. With the exception of *V. oxystoma*, they were also isolated from the cankers, together with *Mycosphaerella tulasnei* (*Cladosporium herbarum*) [ibid., xi, p. 310], *D. pulvis-pyrius* Sacc., and *Papularia sphaerosperma* [ibid., xvii, p. 558].

Besides trees with cankers, there are other cases of die-back associated with abnormal constriction, while yet another form of the disease is characterized by sparse foliation of the crowns and lateral branches. When the trees are cut down before the root-collar becomes involved, the stumps put out new, rapidly growing shoots, which are healthy at first but later die back from the tips.

The roots of alders with die-back are not as a rule discoloured, but those that are yield low percentages of various fungi, e.g., *Bispora* sp., *Leptosphaeria coniothyrium*, *Pezicula cinnamomea*, *Cylindrocarpon radicicola* [ibid., xxv, p. 215], *Myxosporium* sp., *Phoma dunorum* [ibid., xviii, p. 358], *P.* sp. (group 1), *Hypocrea rufa* (*Trichoderma viride*) [ibid., xviii, p. 761], and a sterile, undetermined fungus X. The last-named was also the chief occupant of the discoloured trunk and branch vessels in the early stages of die-back, but it was superseded later by a highly variable microflora, consisting for the most part of *Pezicula cinnamomea*, *Cryptospora suffusa*, *L. coniothyrium*, *Diaporthe alnea*, and *Phoma* sp. (group 1). Inoculation experiments on the roots, trunks, and branches of healthy alders up to 20 years old with a number of the above-mentioned fungi failed to reproduce the symptoms of the die-back observed in nature, but *Pezicula cinnamomea* and *D. alnea*, which caused strictly localized cortical infections on slowly growing and unthrifty trees, may be regarded as weak parasites. *Fusarium sporotrichoides* stimulated atypical callus formation. *C. suffusa* appeared to be purely saprophytic on the bark of diseased trees. Fungus X and the rest of the organisms tested, including *V. oxystoma*, gave negative or doubtful results.

It is concluded that fungi are in any case not solely responsible for the chronic die-back of alders. Chemical analyses of the polder soil have so far yielded no clue to the condition.

Hawboldt (L. S.). **Aspects of Yellow Birch dieback in Nova Scotia.**—*J. For.*, xlv, 6, pp. 414–422, 2 graphs, 1947.

The present paper summarizes the position to date concerning the die-back of yellow birch in Nova Scotia [*R.A.M.*, xxv, p. 375] and recommends salvage operations and light cuttings to improve the vigour of the stands. *Melanconium bicolor* is added to the list of fungi already reported as having been isolated from diseased trees. Evidence is presented in support of the view that other factors besides fungal and insect depredations are implicated in the decadence of the birches, possibly including an extended drought condition during the growing season between 1913 and 1938.

Raggi (C. A.). **Nota sobre un interesante caso de parasitismo del Botrytis cinerea Pers. sobre Eucaliptus sps.** [Note on an interesting case of parasitism by *Botrytis cinerea* Pers. on *Eucalyptus* sp.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, iii, 29, 11 pp., 6 figs., 1947.

Early in 1945 nursery seedlings of *Eucalyptus rostrata* were submitted for examination to the Institute of Plant Hygiene, Buenos Aires, on account of a die-

back originating with a delicate white efflorescence on the upper leaf surfaces which is gradually followed by the development of brown, necrotic, asymmetrical, diffuse spots in the foliar parenchyma and finally by the desiccation and shedding of the leaves. The lesions may extend in the form of vertical stripes to the stems, which are ultimately girdled, and sometimes the entire plant is destroyed. The fungus isolated from the diseased tissues on 1 per cent. dextrose agar was identified by Dr. H. N. Hansen as *Botrytis cinerea* [cf. *R.A.M.*, v, p. 395]. Inoculation experiments with a conidial suspension of the pathogen on *E. rostrata* and *E. teretiscornis* resulted in the typical symptoms of the die-back observed on the former, whereas *E. macrorhyncha* proved to be resistant.

Allen (G. S.). **Mold free germination of coniferous seeds.**—*J. For.*, xlv, 1, p. 51, 1 diag., 1947.

At the Department of Forestry, University of British Columbia, the following procedure has proved effective in the mould-free germination of conifer seeds, especially of stratified Douglas fir (*Pseudotsuga taxifolia*) and grand fir (*Abies grandis*), which are particularly liable to fungal and bacterial contamination. Two enamel or glass trays are used, one slightly larger than the other. The smaller one is filled to within $\frac{1}{4}$ in. of the top with moist washed sand, which is covered with several thicknesses of paper towelling. Over the latter is spread a uniform layer of Du Bay semesan (30 per cent. hydroxymercurichlorophenol) at the rate of about one teaspoonful per sq. ft., on which is superimposed a final cover of paper towelling. The seed is washed thoroughly in a fine screen and spread over the surface of the paper. This pan is now placed within the larger one, the latter being kept filled with water during the germination period, and the seeds covered by a fine screen raised above the seed layer by means of its rigid sides about $\frac{1}{2}$ in. in depth. Over the screen is laid a piece of doubled cheesecloth, its ends dipping into the water.

Nord (F. F.) & Vitucci (J. C.). **On the mechanism of enzyme action. XXIX. The acetate metabolism of certain wood-destroying molds and the mechanism of wood decay.**—*Arch. Biochem., N.Y.*, xiv, 1–2, pp. 229–241, 2 graphs, 1947.

The action of the wood-destroying fungi, *Merulius confluens*, *M. niveus*, *M. tremellosus* [*R.A.M.*, viii, p. 3], and *Fomes annosus* on acetic, glycolic, lactic, pyruvic, succinic, fumaric, malic, dimethylsuccinic, and dimethylfumaric acids was investigated at Fordham University, New York. With the exception of *M. confluens*, the organisms were able to produce oxalic acid in the form of a salt from all the acids. They could utilize oxalic acid in the free state but not when present as a salt. The mechanism of acetate → oxalate transformation proceeds along the following channels: (1) acetic → succinic → fumaric → malic → oxalic acid; (2) acetic → glycolic → glycoxylic → oxalic acid. Cellulose from wood is degraded [cf. next abstract] according to the following phases through the operation of the fungi under observation: cellulose → glucose → ethyl alcohol → acetic acid → oxalic acid.

Nord (F. F.). & Vitucci (J. C.). **On the mechanism of enzyme action. XXX. The formation of methyl-p-methoxylcinnamate by the action of Lentinus lepideus on glucose and xylose.**—*Arch. Biochem., N.Y.*, xiv, 1–2, pp. 243–247, 1947.

A crystalline product, methyl-*p*-methoxylcinnamate, is formed as a metabolite by *Lentinus lepideus* grown on Scots pine wood [*R.A.M.*, xix, p. 448] and also, in the writer's experiments, on a semi-synthetic glucose or xylose medium. These observations lend weight to the concept that the phase sequence of the decomposition of the cellulose of wood [cf. preceding and next abstracts] is initiated by an introductory hydrolysis of the substance by the fungus.

Nord (F. F.) & Vitucci (J. C.). **Enzymatic hydrolysis of cellulose by Coniophora cerebella.**—*Nature, Lond.*, clx, 4060, p. 261, 1947.

During the course of the investigation of the enzymatic activities of wood-destroying moulds [see preceding abstracts] an attempt was made to depict the phase sequence of the degradation of the cellulosic fraction of wood. In tests with filter paper and surgical cotton, *Coniophora cerebella* [*C. puteana*] was found to degrade both forms of cellulose to oxalic acid. Evidence was obtained that a hydrolytic action was involved. Surgical cotton degraded by *C. puteana* for 60 days was examined at certain intervals, employing the analytical technique of Hiller and Pacsu (*Text. Res. J.*, xvi, p. 490, 1946). An increase in reducing power of the residual cellulose was observed as the oxalic-acid content increased.

It is suggested that the enzymatic degradation of cellulose effects a split of 1,4-glycosidic bonds rather than, or concomitant with, a split of semi-acetal linkages.

Harrington (T.) & Hickson (B.). **Chemical preservation reduces timber costs.**—*Int. Indust.*, xxviii, 3, pp. 137–140, 6 figs., 1947.

An interesting survey is given of the development of timber preservation from 1705 to the present day, with special reference to the large-scale operations carried on by Hickson's Timber Impregnation Co. (G. B.) Ltd. It comprises useful information on fungal decay, destruction by insects, methods of impregnation, available preservatives, and testing of preservatives.

Gustafson (R. O.). **Forest fires, basal wounds and resulting damage to timber in an eastern Kentucky Area.**—*Bull. Ky agric. Exp. Sta.* 493, 3 figs., 2 graphs, 15 pp., 1946. [Received August, 1947.]

This study gives an account of forest fires in eastern Kentucky and the resulting damage. Fire wounds are caused and previous wounds enlarged, and the rot developing from these wounds entails losses up to 31 per cent. gross board volume. Frequency of open fire wounds seems to depend on past cutting practices, resistance to decay, thickness of bark, and rate of growth. Of the trees 5 in. in diameter and larger, 30 per cent. have an open basal wound. Conifers have fewer wounds than hardwoods, oaks, yellow poplar [*Liriodendron tulipifera*], and black walnut [*Juglans nigra*] being the least damaged of the hardwoods, while maple [*Acer*] and beech are the most severely injured. The repeated burning by 'light' surface fires causes very great damage to the stands, which become worthless, and prevents the establishment of new, healthy trees.

Smith (F. G.), Link (K. P.), & Walker (J. C.). **Acidic and phenolic fractions of crucifer roots in relation to club-root.**—*J. agric. Res.*, lxxiv, 7–8, pp. 193–204, 1947.

Phenol and acid analyses by modified Folin and diazo techniques (*J. biol. Chem.*, xxiii, pp. 627–650, 1927; *Industr. Engng Chem.*, Analyt. Ed., xi, pp. 423–424, 1939), of fresh root tissues of the Purple Top Milan and Shogoin turnip varieties, resistant and susceptible, respectively, to club root (*Plasmodiophora brassicae*) did not confirm the suspected significance of the phenolic or acidic constituents of such tissues as factors in resistance to the disease [*R.A.M.*, xxvi, p. 370]. Using the so-called PT extraction and fractionation technique in small-scale tests of the 1940 crop of the same two varieties at the Wisconsin Agricultural Experiment Station, highly significant differences, correlating with resistance to club root, were noted in the phenol contents, titratable acidity, and toxicity of the tissues. However, further extensive applications of the same procedure to the 1941 crops of other crucifers of varying reaction to *P. brassicae*, and the elimination of the

hydrogen-ion influence on the toxicity tests, failed to reveal any clear-cut correlation between the phenolic or acidic tissue fractions and resistance to club root.

POUND (G. S.). **Diseases of Cabbage plants grown for seed in Western Washington.** — *Bull. Wash. St. agric. Exp. Sta.* 475, 27 pp., 5 figs., 1946.

A full account is given of the results obtained in disease surveys carried out each summer and autumn from 1943 to 1945 in the Puget Sound area, and principally in Skagit County, Washington, where almost all the cabbage seed produced in the United States was grown before 1942, and where the average annual acreage planted to this crop amounted to approximately 1,000 to 1,200 acres. In addition, the area produces large acreages of turnip and swede. Seed is sown in early June and July, transplanting begins about 1st August, and the seed harvested during July and August of the following year, so the culture allows no cabbage-free period during which disease organisms can be destroyed. During the three years of the investigation, the surveys showed that cabbage mosaic [*R.A.M.*, xxv, p. 243] was the most destructive disease. In the summers of 1943, 1944, and 1945 the disease index (percentage of area infected correlated with severity) for this disease was, respectively, 67·5, 68·9, and 44·6, the corresponding figures for the autumn readings being 57·7, 29·4, and 15·8. Widespread infection in autumn resulted from the close vicinity of the seed beds to diseased seed fields. Up to 1944 the seed beds were located indiscriminately in relation to old seed fields. In late June, aphids increase heavily in seed fields and migrate to the seed beds. Infections in the plant beds often reached 60 to 80 per cent. Beginning with the 1944–5 crop, several seed beds were grown in isolation and approximately 60 per cent. of the transplants set for this crop came from these. The result was a marked drop in the mosaic disease index for the autumn of 1944 and the summer of 1945. Almost all the plants used for the next crop were grown in isolated areas, whereupon the index for the autumn of 1945 fell to 15·8.

Downy mildew (*Peronospora parasitica*) [loc. cit.] occurred in nearly 100 per cent. of the acreage and varied little in severity from year to year. The disease index was 47·4, 53·3, and 41·3 in the summers of the three years, respectively, and 32·8, 35·1, and 31·8 in the autumn readings. The summer of 1945 was much drier than the two earlier ones. The disease usually causes more serious losses in the seed than in the head stage. Fields kept under clean culture, properly staked and twined, were consistently less seriously affected than poorly kept fields.

Ring spot (*Mycosphaerella brassicicola*) [ibid., xxii, p. 335; xxiv, p. 42] showed a disease index of 38·8, 17·5, and 45·9 for the summer readings of the three years, respectively, and 3·2, 13·2, and 14·3 for the autumn readings in the same years. The wide variation in these figures was due to two primary factors, (1) the amount of inoculum left in old seed fields, and (2) initiation of early infections by rains in late summer and early autumn. In the summer of 1943 a very small seed acreage was harvested, and there was consequently little inoculum for the autumn of 1943, so the infection in that season was very slight; by the summer of 1944 every field showed infection, though the attack was not generally severe. The acreage harvested in 1944 was twice the normal size, with the result that sufficient inoculum was present to produce widespread infection in the autumn of 1944. Also, summer and early autumn rains were common in 1944; they led to infection immediately after transplanting and before the inoculum could be destroyed. Hence, the disease became rapidly and widely established in the autumn of 1944. Had the summer of 1945 not been exceptionally dry, the disease index would have been much higher for that season. The high index value in the autumn of 1945 was largely the result of poor crop sanitation. In every instance severe infection was

traceable to the presence of inoculum in unploughed fields in the immediate vicinity. Disking after harvesting gave poor control, only ploughing reducing infection. The disease also attacked turnip, swede, Chinese cabbage, and wild turnip, but much less severely than cabbage.

Stalk rot due to *Sclerotinia sclerotiorum* [ibid., xxiv, pp. 42, 130, 157] was present in almost every field in summer, but its absence or slight development in 70 to 75 per cent. of the acreage made its disease-index value low. Crop sanitation appears to be the only control method. Other diseases were negligible. Descriptions are given of the various diseases. The relative susceptibility of cabbage varieties to *M. brassicicola* ranged from Golden Acre, the most resistant with disease index value of only 55·4; next Round Dutch, 58·4; Resistant Detroit, 59·3; Glory of Enkhuizen, 60·5; to Hollander, 77·1; and Wisconsin Ballhead, 83·6.

Rapin (J.). **Lutte contre la cercosporiose ou maladie des feuilles de la Betterave.** [The control of *Cercospora* or leaf disease of Sugar Beet.]—*Rev. romande Agric., Vitic., Arboric.*, iii, 7, pp. 49–50, 1947.

The three copper-based fungicides, Bordeaux mixture at 1·5 per cent., copper oxide at 0·5 per cent. plus 0·1 per cent. wetting agent, and copper oxychloride at 1 per cent. [*R.A.M.*, xxiv, p. 396] were tested for control of beet leaf spot, *Cercospora beticola* [ibid., xxv, p. 324] at various experimental stations in Switzerland and particularly at Mont-Calme, Lausanne. When the crop was harvested, from 12th to 14th November, it was found that in nearly every case the application of each treatment had increased the yield. In each experiment a double treatment was given, followed by a single later one. The results showed, however, that the time of the applications was of far greater importance than the number given. The best results were obtained when the copper treatments were applied as a protectant just as the leaves had fully developed. The sugar content was increased by the spray treatment, especially at Payerne where infection was very heavy and the increase was from 12·3 per cent. to 16·2, 16·2, and 15·6 per cent. for two applications of the three sprays, respectively.

Wenzl (H.). **Versuche zur Technik der Bekämpfung der Cercospora Blattfleckenkrankheit der Zuckerrübe.** [Experiments on the technique of control of the Sugar Beet *Cercospora* leaf spot disease.]—*Pflanzensch. Ber., Wien*, i, 1–2, pp. 6–13, 1947.

Sugar beet leaf spot (*Cercospora beticola*) is responsible for heavy annual crop reductions, amounting in Upper Austria [*R.A.M.*, xvii, p. 721] to 10 to 15 per cent. of the normal harvest and a corresponding loss of 25 to 30 per cent. fodder. Particulars are given of experiments in 1946, the results of which confirmed earlier (pre-war) observations as to the equal efficacy of spraying only the upper leaf surfaces with the treatment of both sides. The preparations used in these trials were 1·5 per cent. vitigran (copper oxychloride with a 15 per cent. copper content) and 1 per cent. Bordeaux, four applications being made. It is essential to use at least 500 l. of the fungicide per ha. The average increases (in doppelzentner [= 100 kg.]) per ha. in 18 treated over 10 control plots amounted to 123 (73 per cent.) leaves and 53 (15) sugar.

Hull (R.). **Sugar Beet yellows.**—*Farming*, i, 7, pp. 212–216, 4 figs., 1947.

After referring to the losses in yield caused by yellows disease of sugar beet in Great Britain [*R.A.M.*, xxvi, p. 39], the author points out that heavy infestations of *Myzus persicae*, the chief vector [ibid., xxv, pp. 135, 245], commonly arise early in summer near areas of intensive cultivation, e.g., market-gardens. The aphid overwinters in an active form on many plants in glasshouses and on the sprouts

of mangolds in clamps which may be infected, and, migrating directly from them to the young root crop, may start infection very early in the season. Recent observations indicate that *Aphis fabae* [loc. cit.] is less important in spreading the disease than was formerly thought. It is probably most damaging when heavy populations develop on infected beet and mangold seed crops in July. Spindle [*Euonymus europaeus*] and Guelder roses [*Viburnum opulus*], on which it overwinters in the egg stage, are not susceptible to beet yellows, so the migrants must feed on infected plants before they can carry yellows to beet.

In eastern England a large amount of sugar beet and mangold seed is grown and the 'stecklings' (plants set out to produce seed) are often infected in the nursery. The diseased seed crops thus produced constitute a large reservoir of infection, and the heavy aphid infestations on them spread the disease to root crops in the vicinity.

The relative importance of different sources of the virus varies from district to district. Local spread sometimes occurs round mangold clamps. Red beet, when clamped, may also act as a source of infection. Beet plants found in spring in fields which carried beets the previous year are seldom infested with aphids, but in special circumstances may become so and spread the disease to root crops.

Because of the complexities of the cycle of infection, no one control measure is likely to be wholly effective. The best solution at present appears to lie in eliminating the sources of the virus. One way to prevent infection in the seed crop is to raise the 'stecklings' in areas where the likelihood of their becoming infected is least and then transport them for planting out in the present seed-growing areas. The most suitable districts in which to raise the 'stecklings' are those mainly given over to pasture or cereals. The locality should be relatively free from mangold and sugar beet and any crops growing in the neighbourhood should be examined for the disease and its vectors. This plan was carried out on a commercial scale in 1945–6, and the resulting seed crops (which showed under 5 per cent. infection) were greatly superior to those grown from 'stecklings' in other areas, which contained 50 to 100 per cent. infected plants. To take one instance, plants raised in south Lincolnshire became 100 per cent. infected and yielded 12 cwt. per acre of seed, as against 26 cwt. per acre for plants raised in isolation.

In places where seed and root beet crops are not grown intensively, infection can be reduced if the seed is sown as late as is consistent with obtaining plants large enough for transplanting. In one trial in 1945, plants sown in mid-July contracted 30 per cent. infection as against only 5 per cent. for those sown in mid-August. Infection may be still further reduced by spraying with an insecticide, usually incorporated in Bordeaux mixture, at least fortnightly through the autumn, but the most effective spray is that applied about the middle or end of October.

At present it is not possible to give detailed measures directed against spread from mangold clamps, but the sites should be cleared as soon as the roots are finished. If mangolds are kept into the summer the shoots on the surface should be nicotine-dusted if aphids are found on them. Groundkeepers should be kept down as much as possible. Early and thick sowing is advised for root crops.

Giddings (N. J.). **Dodder as an aid in testing some plant species for curly-top virus.**—*Phytopathology*, xxxvii, 5, pp. 278–280, 1 fig., 1947.

Several species of *Nicotiana* and tomato varieties are susceptible to beet curly top virus but are unsatisfactory hosts for the vector, *Eutettix tenellus*. Dodder (*Cuscuta*) thrives upon such hosts, taking up the virus, and *E. tenellus* feeds well upon the dodder, readily picking up the virus. During 1938–9 three groups of previously inoculated Turkish tobacco plants were tested for the presence of the beet curly top virus by means of dodder (*C. subinclusa*) [*R.A.M.*, xxiv, p. 136],

using young sugar beets as test plants and one leafhopper (*Eutettix tenellus*) per plant for inoculation and five groups using leafhoppers without dodder. Of the 49 tobacco plants tested by the latter method, transmission to sugar beets failed in 45 per cent., the corresponding figure for the 24 on which dodder was used being only 25. There was more than $2\frac{1}{2}$ times as much infection among the sugar beet plants when *C. inclusa* was used (52 per cent. diseased) as when the trial was made with leafhoppers transferred directly from tobacco (20 per cent.).

In a comparative experiment in 1939 with inoculated plants of *Nicotiana glutinosa* there was more than five times as much curly top in the sugar beet test plants when dodder was used as with the direct feeding method.

Jauch (Clotilde). **La 'mancha chocolate' de les Habas.** [Chocolate spot of Broad Beans.]—*Rev. Invest. agríc., B. Aires,* i, 2, pp. 65–80, 4 pl., 2 figs., 1947.

In the vicinity of Buenos Aires chocolate spot of broad beans is caused by two species of *Botrytis*, *B. fabae* [*R.A.M.*, xxvi, p. 476, and next abstract] and *B. cinerea* [ibid., xvi, p. 723], of which the former appears to be the more widespread and virulent. Wilson's 'aggressive' and 'non-aggressive' types of foliar infection were both recognized, the former characterized by diffuse, leaden-grey lesions and the latter by amphigenous, circular, chocolate-coloured spots, 1 to 3 mm. in diameter. On the stems the lesions are elongated, somewhat depressed, and nearly always bordered by a reddish line; towards the base they are so numerous as to impart a necrotic aspect to the infected area. Both the sepals and petals are dotted with small, dark spots, which stand out prominently on the white ground: some are rounded, others elongated, with dark brown centres paling towards the edge and encircled by a halo. In severe attacks the inflorescences present a necrotic appearance within two days, a diffuse, black tinge spreading from the tip over the whole petal. In many cases the small, dark spots on the pods are largely confined to the one surface or edge exposed to the spores borne on the wind prevailing during the growing period. The lesions were repeatedly observed to harbour varying numbers of sclerotia, 0·5 to 1 by 0·5 to 2 mm., which also developed on the stems of withered plants in the field [cf. ibid., xiii, p. 741].

Monospore cultures of *B. fabae* on 13 media fell into two types, designated A and B, but there was no corresponding segregation in *B. cinerea*. On maize meal agar *B. fabae* A formed a profusion of sclerotia, which were also numerous on various other substrata, including potato dextrose agar, broad bean seed decoction with gelatine or dextrose and agar, and carrot agar. *B. fabae* B produced few or no sclerotia on most media, only sterilized broad bean stems lending a moderate stimulus to their formation. A fair number of sclerotia of *B. cinerea* developed on maize meal, potato dextrose, and carrot agars. Neither type of *B. fabae* formed many macroconidia except on broad bean decoction with dextrose and agar (A) or gelatine (B). The latter medium also promoted microconidial formation by type B, but A did not produce large quantities of these spores on any substratum, the best for the purpose being broad bean decoction dextrose agar, sterilized rice, and sterilized broad bean stems. The extent and colour of the mycelium also varied with the medium, that of *B. fabae* A being generally sparser than that of type B or *B. cinerea* except on the broad bean decoctions; *B. cinerea* was grey on all the media except asparagin agar (light brownish) and broad bean seed decoction with gelatine (white), whereas the two types of *B. fabae* ranged from white to light brownish.

The typical symptoms of chocolate spot developed in broad bean plants inoculated with both species of *Botrytis* through the leaves, stems, flowers, and pods. In field experiments in 1944 to determine the reactions to chocolate spot of five varieties, viz., Agua dulce, Argentina, del País, de Sevilla, and Windsor, in con-

junction with the sowing date, all were found to be susceptible. The incidence of infection was highest in the two first of the fortnightly sowings made from 16th April to 2nd August, inclusive, and decreased as the season advanced, the stands of the two latest dates being virtually free from chocolate spot. Spraying was found to be profitable only in wet seasons, when 1 per cent. Bordeaux mixture should be applied during the flowering and fruiting periods.

A virulent outbreak of *Ascochyta fabae* [ibid., xxiv, p. 129] occurred on the Argentina and del País varieties.

Reichert (I.) & Palti (J.). **Rust and chocolate spot of Broad Beans in Palestine.**—*Palest. J. Bot.*, R. Ser., v, 2, pp. 202–213, 1 fig., 1946. [Hebrew summary.]

Investigations were carried out from 1939 to 1943 to determine the best methods of broad bean cultivation in Palestine to avoid excessive losses from rust (*Uromyces fabae*) [*R.A.M.*, xxiii, p. 253] and chocolate spot (*Botrytis fabae*) [ibid., xx, p. 188, and cf. preceding abstract]. The latter disease was simultaneously recorded in widely separated parts of the country, comprising the coastal plain, Jordan Valley, and Upper Galilee. In November- to December-sown crops, *B. fabae* usually appeared in January, irrespective of marked differences in the mean temperature, e.g., 10° C. at Mikve Israel (central coastal plain) in December to January, 1941 -2, compared with 16° in 1940–1. On the other hand, the dates of rust development on comparable crops in the several localities often differed by as much as two months, depending on temperature levels. At daily means of 10° or below, for instance, rust was never observed to occur, while during or after months with daily means of 12·5° it was sporadic. At and above 14° infection took place regularly at relative humidities from 73 to 78 per cent. in localities where the preceding month was also fairly warm, but not at 68 per cent. where the foregoing months were colder.

In four spraying trials the two diseases were effectively combated by $\frac{1}{3}$ per cent. perenox, the first application being given immediately after the appearance of symptoms and repeated at 10- to 14-day intervals. The treatments significantly increased the green pod yield (by 58 per cent.) in early and severe attacks of rust. Crops grown for green fodder or green pods should be sown sufficiently early for picking to begin in the first days of February. No practical control measures can be recommended for non-irrigated crops (for silage and seeds), which cannot be sown until after the first rain, and their cultivation entails a considerable risk unless varieties resistant to rust and chocolate spot can be procured.

Dana (B. F.). **Phyllody of common Beans, a graft-transmissible disease.**—Abs. in *Phytopathology*, xxxvii, 5, pp. 360–361, 1947.

Scions from phylloid inflorescences of naturally infected beans [*Phaseolus vulgaris*: *R.A.M.*, xx, p. 225], cleft-grafted on ten greenhouse plants of the Red Kidney, Bountiful, Asgrow Stringless Green Pod, and U.S. No. 5 varieties, induced phyllody in nine. In their turn, scions from the phylloid inflorescences of the inoculated individuals transmitted the disease to 11 out of 20 plants of Logan, Red Kidney, Bayo, Bountiful, and U.S. No. 5. Phyllody has been observed in Oregon on bean varieties resistant to curly top [beet curly top virus: ibid., xxii, p. 86; xxv, p. 592] as well as on plants of susceptible ones that escaped infection. A similar disease, big bud [tomato big bud virus], occurs on tomato [ibid., xx, p. 235; xxvi, p. 135], while a condition apparently identical with phyllody has been observed on various hosts of the aster yellows virus [ibid., xxv, p. 396]. It seems, therefore, that one or more strains of the aster yellows virus may be implicated in the occurence of phyllody on bean, Lima bean [*P. lunatus*], soy-bean, tomato, lucerne, and squash.

Silberschmidt (K.) & Nobrega (N. R.). **Notas sôbre uma doença de virus em Feijão de Porco (Canavalia ensiformis D.C.) e outra em Feijão comum (Phaseolus vulgaris L.).** [Notes on a virus disease of Hog Bean (*Canavalia ensiformis* D.C.) and another of common Bean (*Phaseolus vulgaris* L.).]—*Biológico*, viii, 5, pp. 129–133, 2 pl., 1942. [English summary. Received August, 1947.]

A young hog [sword] bean (*Canavalia ensiformis*) plant in an experimental field in São Paulo, Brazil, displayed interveinal chlorosis and veinbanding of the leaves, producing a mosaic pattern without blistering. The disease was transmitted by sap inoculation to the original host, *Soja* [? *Glycine*] sp., sweet pea, and the Embaré, Torta, and Mangetail pea varieties.

Four bean (*Phaseolus vulgaris*) plants in a garden in the same locality showed foliar mottling, accompanied in the older leaves by slight rugosity and savoying of the lamina [cf. *R.A.M.*, xxi, p. 115]. The disease was conveyed by sap inoculation to Longfellow and Don Carlos beans and Torta and Mangetail peas.

The viruses responsible for both diseases are believed to belong to the pea group but to be distinct from one another.

Yu (T. F.). **A mosaic disease of Cowpea (Vigna sinensis Endl.).**—*Ann. appl. Biol.*, xxxiii, 4, pp. 450–454, 1 pl., 1946.

In 1939 a mosaic disease of cowpea (*Vigna sinensis*) [*V. unguiculata*: *R.A.M.*, xviii, p. 608; xxvi, p. 479] was very prevalent in the Yangtze valley, China, sometimes causing heavy losses in susceptible varieties. The symptoms differ with different varieties and, in the same variety, with the type of leaf, time of infection, climatic conditions, and individual plant. The first symptom in artificially infected plants is vein clearing, spreading from the base of the leaf over the whole surface. After 10 to 12 days the symptoms on the young inner leaves change to a conspicuous mottling. The irregular light and dark green areas between the veins may produce little or no distortion of the leaf surface of less susceptible varieties. Chlorotic areas are generally distinctly demarcated from the green tissue. In some cases, almost the whole leaflet is chlorotic, while others show only small chlorotic blotches. The irregular, light green patches frequently contain islets of normal green, often parallel to the veins. Accompanying the mosaic symptoms, a slight convex cupping, arching, or inward rolling of the margin of the leaflets is often present. Affected leaves are often puckered, with deep marginal indentations. In some varieties and in certain climatic conditions, yellow primary lesions develop, turning dark brown at the end of the growing season. Dark reddish-brown discoloration may also be produced on the veins. As a rule, the symptoms are most severe in the upper part of the plant. The top leaves, in addition to showing the symptoms described above, are stunted, misshapen, and puckered, with dark green areas along the veins. The affected leaflets tend to be asymmetrical, dwarfed, wrinkled, crinkled, deformed, twisted, and curled either inwards or downwards about the margin. The plants are stunted, have shortened internodes, and branch excessively, while pod deformation is common on susceptible varieties such as Long Pod.

Experimental evidence showed that the virus is transmitted by *Aphis rumicis*, *Macrosiphum pisi*, and *A. gossypii*, as well as by artificial juice inoculation. It is seed-borne, withstands ageing *in vitro* for three days at 22° C., is inactivated at about 62°, and tolerates a dilution of about 1 in 3,000. It was mechanically and aphid transmitted to Lima bean (*Phaseolus lunatus macrocarpus*) and adzuki bean (*P. angularis* var. Chu-Sha).

The symptoms and properties of the virus closely resemble those of asparagus bean (*V. sesquipedalis*) mosaic, while, on the other hand, its symptoms and host range closely resemble those of McLean's cowpea mosaic [caused by a strain of

cucumber mosaic virus; loc. cit.]. The three viruses appear to be closely related, if not identical.

SEVERIN (H. H. P.) **Newly discovered leafhopper vectors of California Aster-yellows virus.**—Abs. in *Phytopathology*, xxxvii, 5, p. 364, 1947.

The following leafhoppers, in addition to those already reported [*R.A.M.*, xxvi, pp. 277–279 and next abstract], have recently been determined as vectors of the California aster yellows virus, which now number in all 22 species and one biological race belonging to 12 genera: *Idiodonus heidemani*, *Colladonus commissus*, *C. flavocapitatus*, *Friscanus intricatus*, *F. rupinatus*, *Cloanthanus dubius*, *Fiebriella florii*, and *Chlorotettix similis*.

SEVERIN (H. H. P.). **Plant symptoms induced by feeding of some leafhopper species.**—*Hilgardia*, xvii, 5, pp. 219–221, 4 pl., 1 fig., 1947.

Brief descriptions are given of the symptoms of chlorosis, veinbanding, and vein clearing, produced on healthy China aster and Golden Leaf-Blanching celery plants by 10 species of leafhopper vectors of California aster yellows [*R.A.M.*, xxv, p. 285 and preceding and next abstracts], caused apparently by the saliva or feeding.

SEVERIN (H. H. P.). **Acinopterus angulatus, a newly discovered leafhopper vector of California Aster-yellows virus.**—*Hilgardia*, xvii, 5, pp. 197–205, 1 col. pl., 1947.

In studies of the transmission of the California aster yellows virus [see preceding abstract] by the leafhopper *Acinopterus angulatus* to celery and asters it was found that transmission from diseased celery by 50 males and 50 females tested singly on healthy celery averaged 8 per cent. The average percentage of infection of successive celery at irregular intervals of inoculation by lots of 5 males and 5 females was 29·8, by lots of 10 males and 10 females, 51·9, and by lots of 20 males and 20 females, 35·6. The total percentages of infection in weekly inoculations of celery by lots of 5, 10, and 20 males were 8·3, 18·3, and 15, respectively, and by lots of 10 females at three-weekly intervals 46·3.

Infections by 50 males and 50 females transferred singly from diseased celery to healthy asters averaged 9 per cent. The total percentage of infections produced in successive asters by lots of 10 and 20 males transferred at irregular intervals was 14·3, while with lots of 5 and 10 males transferred at three-weekly intervals the percentages were 9·1 and 18·7, respectively.

Weekly inoculations of celery alternating with asters by lots of 40 males reared on diseased celery gave the following percentages of infection: celery 53·3 and asters 26·7; those reared on diseased asters and transferred to asters alternating with celery, 40 and 20, respectively.

The minimum latent period of the virus in male adults ranged from 11 to 26 (average 18·4) days. One female retained the virus for 51 days after producing the first infection, other adults caused only the first infection.

ZABALA (S.) & DELLE COSTE (A. C.). **Identificación del 'polvillo' del Tabaco con uno de los mosaicos del Pimento.** [Identification of the Tobacco 'fine dust' with one of the Chilli mosaics.]—*Rev. argent. Agron.*, xiii, 3, pp. 167–180, 1 pl., 1947.

A study of the symptomatology, physical properties, mode of transmission, and host range of a chilli mosaic in Argentina revealed the identity of the virus concerned with that of the 'polvillo' or 'fine dust' of tobacco [*R.A.M.*, xi, p. 269]. It is evidently distinct from the viruses responsible for 'blanching' of the same host in Spain [ibid., xx, p. 225] and mosaic in Puerto Rico [ibid., xxi, p. 401], and is provisionally regarded as a new infectious entity.

The thermal death point of the virus lies between 56° and 58° C. It tolerates a dilution of 1 in 10,000 but is inactivated at 1 in 100,000. It loses its pathogenicity after 22 hours at 22° to 25°. It is not transmissible by way of the seed but is readily conveyed from diseased to healthy plants by juice inoculations; *Myzus persicae* was the only one of eight insects tested to give positive results in transmission experiments. The virus was inactivated by the admixture with the juice of 50 per cent. absolute alcohol, 1 per cent. 0·1 M potassium cyanide, or 2 per mille mercuric chloride.

The common name of 'mosaic' adequately describes the symptoms on chilli, which include a very irregular mottling of the leaves, with a vivid green coloration of the parts bordering the veins, pronounced distortion, and slight marginal undulation; alternate chlorotic and bright green spotting of the stunted and malformed fruits; shortening of the internodes and foliar mottling of the new shoots; stunting of the plants and extensive floral abortion. 'Polvillo', on the other hand, is not an appropriate designation for the tobacco disease caused by the same virus, but it is in general use among growers and should therefore be accepted.

Baker (K. F.). **Transmission of Rhizoctonia solani in Pepper seed and its prevention.**—Abs. in *Phytopathology*, xxxvii, 5, p. 359, 1947.

[Chilli] pepper seedlings are liable to severe damage from pre- and post-emergence damping-off (*Rhizoctonia* [*Corticium*] *solani*) in southern California. The transmission of the fungus within the seed was demonstrated by planting infected seed on moistened, pasteurized black peat in Petri dishes and by sectioning. Large fruits in particular frequently rest on the ground in seed fields and much 'soil rot' occurs before the delayed harvest. The pathogen enters the seed from the funiculus in the micropyle-radical region. Further infection is favoured by maceration and fermentation in cleaning. The pathogen is also carried in fragments of fruit tissue. Up to 0·3 per cent. of commercial seed is infected, a matter of importance in (*a*) the contamination of pasteurized or non-infested soil and (*b*) the perpetuation of strains causing damping-off, wire stem, and fruit rot. Half an hour's immersion of the seed in water at 51·7° C. eliminated *C. solani* without reduction of germination in large-scale tests over a period of three years.

Blumer (S.) & Peyer (E.). **Versuche zur Bekämpfung der Peronospora im Weinbau.** [Experiments in *Peronospora* control in viticulture.]—*Schweiz. Z. Obst- u. Weinb.*, lvi, 4, pp. 62–67, 3 figs., 1947.

Copper oxide (0·4 to 0·5 per cent.) did not confer such a high degree of protection against downy mildew (*Peronospora*) [*Plasmopara viticola*] in the Wädenswil (Zürich) Experiment Station vineyards in 1946 as 1·3 to 1·5 per cent. Bordeaux mixture [*R.A.M.*, xxvi, p. 182 and next abstract]. In the nursery copper oxide is preferable to Bordeaux mixture in the early stages of growth, since it does not scorch the plants and consequently permits early and luxuriant leafage, which in turn promotes root development. Later in the season, however, 1 per cent. Bordeaux should be applied.

Zäch (C.). **Über die Regenbeständigkeit von Kupferspritzmitteln. Laboratoriumsversuche an Spritzmitteln für den Weinbau.** [On the rain-fastness of copper sprays. Laboratory tests on copper sprays for viticulture.]—*Schweiz. Z. Obst- u. Weinb.*, lvi, 4, pp. 67–70, 2 graphs, 1947.

To determine the relative tenacity of various copper mixtures used against downy mildew [*Plasmopara viticola*] in Swiss vineyards [see preceding abstract], vine leaves, 15 cm. in diameter, or alternatively glass slides, 70 by 35 mm. (16 per test), were uniformly covered with the different materials and then subjected for

half an hour to artificial rain (corresponding to a precipitation of 10 mm.) from a modified Görnitz apparatus [*R.A.M.*, xii, p. 577]. The amount of copper thus deposited on the leaves and slides ranged from 1 to 3 and 0·5 to 1 mg., respectively, per 100 c.c. Under these conditions Bordeaux mixture was the most persistent of the fungicides tested, followed in descending order by copper oxychloride pastes, copper oxide, and copper oxychloride dust.

Blumer (S.). **Versuche zur Bekämpfung der Graufäule (Botrytis cinerea).** [Experiments in the control of grey mould (*Botrytis cinerea*).]—*Schweiz. Z. Obst- u. Weinb.*, lvi, 4, pp. 51–61, 3 figs., 1 graph, 1947.

Grey mould (*Botrytis cinerea*) is responsible for more or less severe annual depredations in Swiss vineyards [*R.A.M.*, xxvi, p. 185], especially among the Riesling × Sylvaner and Blue Burgundy varieties. Although both thiuram (organol and pomarsol) and oxyquinoline (travacid with adhesive and tumex liquid) preparations gave encouraging results in control experiments from 1944 to 1946, inclusive, they are at present too erratic in operation to be recommended for commercial use, while another objection lies in the increased development on the treated grapes of other fungi, notably green mould (*Penicillium*) normally held in check by *B. cinerea*.

Peyer (E.). **Fragen und Antworten über die Rotbrennerbekämpfung.** [Questions and answers on 'rotbrenner' control.]—*Schweiz. Z. Obst- u. Weinb.*, lvi, 4, pp. 75–76, 1947.

Some important questions relating to the control of vine 'rotbrenner' [*Pseudopeziza tracheiphila*] in Switzerland [*R.A.M.*, xxvi, p. 376] are answered on the basis of the author's practical experience during the past four years. The fungus overwinters exclusively in infected leaf debris, from which spores are discharged in the spring or, in dry seasons, until the late summer, giving rise to fresh infections. Proof that the disease can be effectively combated in plots heavily infested the year before was obtained in 1945, when vines sprayed on 29th April, 9th, 18th, and 31st May, 18th June, and so forth, remained entirely healthy. The general opinion that only the first fungicidal treatment is of any avail against the pathogen has been disproved by experiments carried out since 1942. A very early application, when the shoots are 15 to 20 cm. long, may be critical, but the following treatments were equally if not more so during the period under review, when primary infection occurred mostly between the first and second or second and third, e.g., in 1943 at the end of May, 1944 from 18th to 25th June, 1945 at the beginning of June, and 1946 between 13th and 18th May.

During the crucial period for infection, therefore, the vines should be sprayed weekly, preferably with 1·5 to 2 per cent. Bordeaux mixture at dosages of 25 to 30 l. per are [100 sq. m.] for hybrids and 20 to 25 for direct bearers. Other control measures include the prompt collection and burning of newly infected leaves and of those blown against walls or into ditches, and deep ploughing of the soil to bury these sources of contamination.

The most susceptible varieties are Blue Burgundy, Gutedel, and Elbling, but Räuschling and Riesling × Sylvaner were also heavily infected during the period of observation in the dry sites which have been found specially favourable to the fungus.

In 1942 and 1943, at the beginning of the present epidemic, the damage caused by *P. tracheiphila* was generally considered to be negligible, but after several consecutive years of infection the vines have been found to suffer appreciably both in respect of development and in the quantity and quality of the yields. Failure to recognize the serious character of the disease in time was the main reason for its extensive spread, which has been aided by the dry periods in every spring since

1942, as well as by the stringent copper shortage during the war. Energetic measures are now necessary to eliminate the parasite by means of an intensive spraying campaign, comprising at least three pre-blossom applications.

Hewitt (W. B.). **Sodium arsenite, a promising control of dead-arm of Grapes.**—Abs. in *Phytopathology*, xxxvii, 5, p. 362, 1947.

Olivette blanche vines [? in California], infected with *Cryptosporella viticola* [*R.A.M.*, xxiv, p. 3], were sprayed during dormancy with a sodium arsenite solution containing an equivalent of 3 lb. arsenic trioxide per 100 gals. water. Three blocks of vines, six rows each, averaging 43 shoots per vine, sprayed on 11th February, 1944, showed, respectively, averages of 4·6, 4·9, and 5·1 diseased shoots per vine, the corresponding figures for untreated blocks being 27, 25·5, and 22·6. Similar blocks sprayed in 1945 were little affected by dead arm. In 1946 shoot and leaf infections were mild, but in three blocks sprayed on 14th March one or more diseased shoots developed on 2·6, 18·7, and 7·3 per cent. of the vines compared with 46·6, 27·5, and 52·6 per cent. in corresponding untreated blocks. In random collections of material from the 1944 plots 1 to 10 per cent. of the pycnidia on 38 out of 138 sprayed spurs and 60 to 85 per cent. of those on 93 out of 106 untreated spurs extruded spore horns.

Nysterakis (F.). **Nouvelle interprétation du mécanisme du rabougrissement (court-noué) des Vignes.** [A new interpretation of the mechanism of Vine court-noué.]—*Rev. hort., Paris*, N.S., xxx, 17–18, pp. 306–315, 7 figs., 1947.

This is an account of work previously noted from another source [*R.A.M.*, xxv, p. 95].

Ryjkoff (V. L.). Фитопатогенные вирусы. [Phytopathogenic viruses.]—219 pp., 50 figs., Publ. Dep. Acad. Sci. S.S.S.R., Moscow, Leningrad, 1946.

This handbook gives descriptions of virus diseases prevalent in the U.S.S.R. The diseases are discussed according to the family of the host plant and separate chapters are devoted to the following topics: (i) virus diseases of the nettle and related plants, (ii) those of the Chenopodiaceae, (iii) cruciferous plants, (iv) Malvaceae, (v) the vine, (vi) fruit trees of the Rosiflorae group, (vii) Rosaceae (raspberry, strawberry, and rose), (viii) Leguminosae, (ix) Umbelliferae, (x) Solanaceae (tobacco), (xi) Solanaceae (potato), (xii) vegetable marrow, (xiii) Compositae, (xiv) Gramineae, and (xv) Liliaceae. The symptoms of each disease are described and directions for control given. The author adopts K. M. Smith's nomenclature for the viruses.

Jeffers (W. F.). **Evaluation of several fungicides in preventing infection of Sweet Potato slices by Ceratostomella fimbriata.**—Abs. in *Phytopathology*, xxx, vii, 6, p. 439, 1947.

Slices of Maryland sweet potato were placed in an inoculum of *Ceratostomella fimbriata*, the causal organism of black rot, and then dipped in one of a series of dilutions of several fungicides ranging from 0·001 to 100 gm. per l. The pieces were then incubated in moist chambers at 28° C. for four days. By this time the surfaces of the control slices dipped in water were covered with the fungal growth, ascospores and conidia being produced in abundance. High toxicity to the pathogen was shown by puratized N5E, isothan Q15 [*R.A.M.*, xxvi, pp. 67, 97, 211], mercuric chloride, semesan bel, and puratized 177 (para-amino phenyl cadmium dilactate). Borax, wettable spergon, zerlate, and phygon [loc. cit.] were moderately effective, copper 8-hydroxyquinolate, fermate, and zinc ethylene bisdithiocarbamate only slightly so. In general, the chemicals giving best control of *C. fimbriata* were most injurious to the host tissue.